UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

ENVIRONMENTAL ASSESSMENT

Reducing Double-crested Cormorant Damage Through an Integrated Wildlife Damage Management Program In the State of Alabama

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UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

In Cooperation with:

Tennessee Valley Authority

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LIST OF TABLES AND FIGURES

SUMMARY OF PROPOSED ACTION

The United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (USDA, APHIS, WS) proposes to implement a double-crested cormorant (*Phalacrocorax auritus*) damage management program in the State of Alabama, including the implementation of the Public Resource Depredation Order (PRDO) (50 CFR 21.48) and winter roost control as specified in the Aquaculture Depredation Order (AQDO) (50 CFR 21.47). An Integrated Wildlife Damage Management (IWDM) approach would be implemented to reduce cormorant damage and conflicts to aquaculture, property, natural resources, and human health and safety. Damage management would be conducted on public and private property in Alabama when the resource owner (property owner) or manager requests WS assistance. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion, habitat modification, or harassment would be recommended and utilized to reduce damage. In other situations, birds would be humanely removed through use of shooting, egg addling/destruction, nest destruction, or euthanasia following live capture. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where the application of lethal methods alone would be the most appropriate strategy. Wildlife damage management activities would be conducted in the State, when requested and funded, on private or public property, after an *Agreement for Control* or other comparable document has been completed. WS will acquire the necessary landowner permission prior to conducting cormorant damage management activities, including the appropriate landowner permission prior to conducting winter roost control. All management activities would comply with appropriate Federal, State, and Local laws, including applicable laws and regulations authorizing take of double-crested cormorants, and their nests and eggs.

ACRONYMS

ADC	Animal Damage Control
ADC&NR	Alabama Department of Conservation & Natural Resources
APHIS	Animal and Plant Health Inspection Service
AQDO	Aquaculture Depredation Order
AVMA	American Veterinary Medical Association
BBS	Breeding Bird Survey
BO	Biological Opinion
CDM	Cormorant Damage Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DCCO	Double-crested Cormorant
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FY	Fiscal Year
IWDM	Integrated Wildlife Damage Management
MBTA	Migratory Bird Treaty Act
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NWRC	National Wildlife Research Center
PRDO	Public Resource Depredation Order
ROD	Record of Decision
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
TVA	Tennessee Valley Authority
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WS	Wildlife Services

NOTE: On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The terms Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this Environmental Assessment.

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with wildlife which increases the potential for conflicting human/wildlife interactions. In addition, segments of the public desire protection for all wildlife; this protection can create localized conflicts between human and wildlife activities. The *Animal Damage Control Programmatic Final Environmental Impact Statement* (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way - United States Department of Agriculture (USDA) 1997:

> "*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well.*"

Wildlife damage management is the science of reducing damage or other problems associated with wildlife and is recognized as an integral part of wildlife management (The Wildlife Society 1990). The USDA, Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program (formerly known as Animal Damage Control) uses an Integrated Wildlife Damage Management (IWDM) approach, known as Integrated Pest Management (WS Directive 2.105[1]), in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1:1-7 of USDA (1997). These methods may include alteration of cultural practices and habitat and behavioral modification to prevent or reduce damage. The reduction of wildlife damage may also require that local populations be reduced through lethal means. Wildlife damage management is not based on punishing offending animals but as one means of reducing damage and is used as part of the WS Decision Model (Slate et al. 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated. The need for action is derived from the specific threats to resources or the public.

USDA/APHIS/WS is authorized by Congress to manage a program to reduce human/wildlife conflicts (Act of March 2, 1931, as amended (46 Stat. 1486; 7 U.S.C. 426-426c) and the Rural Development, Agriculture, Related Agencies Appropriations Act of 1988, Public Law 100-102, Dec. 27, 1987. Stat. 1329-1331 (7 U.S.C. 426c), and the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act of 2001, Public Law 106-387, October 28, 2000. Stat. 1549 (Sec 767)). WS's mission is to "provide leadership in wildlife damage control to protect America's agricultural, industrial and natural resources, and to safeguard public health and safety (USDA 1989)." This is accomplished through:

- training of wildlife damage management professionals;
- development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
- collection, evaluation, and dissemination of management information;
- cooperative wildlife damage management programs;
- informing and educating the public on how to reduce wildlife damage and;
- providing data and a source for limited-use management materials and equipment, including

[1] WS Policy Manual - Provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Appendix.

pesticides (USDA 1989).

This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts with the double-crested cormorant (*Phalacrocorax auritus*) in the State of Alabama. This analysis relies on data contained in published documents (Appendix A), including the *Animal Damage Control Program Final Environmental Impact Statement* (USDA 1997) and *United States Fish and Wildlife Service Final Environmental Impact Statement: Double-crested Cormorant Management in the United States* (USFWS 2003).

WS is a cooperatively funded, service-oriented program. Before any operational wildlife damage management is conducted, *Agreements for Control* or *WS Work Plans* must be completed by WS and the landowner/administrator. WS cooperates with other Federal, State and Local government entities, private property owners and managers, and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable Federal, State, and Local laws.

Individual actions on the types of sites encompassed by this analysis may be categorically excluded under the APHIS Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) (7 CFR 372.5(c)). APHIS Implementing Regulations also provide that all technical assistance furnished by WS is categorically excluded (7 CFR 372.5(c)) (60 Federal Register 6,000, 6,003 (1995)). Double-crested cormorant (DCCO) damage management is a large component of the Alabama WS program. Therefore, WS has decided to prepare this EA to assist in planning cormorant damage management activities and to clearly communicate with the public the analysis of cumulative effects for a number of issues of concern in relation to alternative means of meeting needs for such management in the State. This analysis covers WS's plans for current and future Double-crested Cormorant Damage Management (CDM) actions wherever they might be requested within the State of Alabama.

1.1 PURPOSE

The purpose of this EA is to analyze the effects of WS activities in Alabama to manage damage and conflicts caused by double-crested cormorants. Resources protected by such activities include aquaculture, property, natural resources, and human health and safety.

1.2 NEED FOR ACTION

As stated in the USFWS FEIS (USFWS 2003), the recent increase in the North American DCCO population, and subsequent range expansion, has been well-documented along with concerns of negative impacts associated with this expanding population. Wires et al. (2001) and Jackson and Jackson (1995) have suggested that the current DCCO resurgence may be, at least in part, a population recovery following years of DDT-induced reproductive suppression and unregulated take prior to protection under the MBTA. Nonetheless, there appears to be a correlation between increasing DCCO populations and growing concern about associated negative impacts, thus creating a very real management need to address those concerns.

The need to protect aquaculture, property, natural resources, and human health and safety from damage and conflicts associated with DCCOs is described in the USFWS FEIS (USFWS 2003) and is summarized in the following subsections.

1.2.1 Need for CDM to Protect Aquaculture

The impacts that DCCOs are having on the aquaculture industry in Alabama is of great concern to those involved in the industry. Double-crested cormorants can feed heavily on fish being raised for human consumption, and on fish commercially raised for bait and other purposes in Alabama (USFWS 2003). The principal species propagated in the United States are catfish, trout, salmon, tilapia, hybrid striped bass, mollusks, shrimp, crayfish, baitfish and ornamental tropical fish (Price

and Nickum 1995; USDA 2000). A 1998 census revealed that the U.S. domestic aquaculture industry represents slightly over 4,000 farms, with total sales reaching $978 million (USDA 2000). In 2003, there were 231 commercial catfish aquaculture facilities (USDA-NASS 2004), with no federal, 3 state operated, and approximately 50 private (e.g., American Sportfish, etc.) fish hatcheries in Alabama. In Alabama, channel catfish comprises the largest segment of the commercial aquaculture industry in the state. Alabama catfish farms represented approximately 20% of the total catfish sales in the U.S. in 2003, with over $85 million in sales (USDA-NASS 2004). There were more than 187,200 acres of catfish ponds in the United States as of July 1, 2003, with 25,500 acres (14%) located in Alabama (USDA-NASS 2004). According to the Alabama Agricultural Statistics Service (2004), over 90 percent of Alabama's aquaculture ponds are found in the west-central portion of Alabama, with Hale County alone accounting for 42 percent.

The frequency of occurrence of cormorants at a given aquaculture facility can be a function of many interacting factors, including: (1) size of the regional and local cormorant population; (2) the number, size, and distribution of ponds; (3) the size distribution, density, health, and species composition of fish populations in the ponds; (4) the number, size, and distribution of natural wetlands in the immediate environs; (5) the size distribution, density, health, and species composition of natural fish populations in the surrounding landscape; (6) the number, size, and distribution of suitable roosting habitat; and (7) the variety, intensity and distribution of local damage abatement activities. Cormorants are adept at seeking out the most favorable foraging and roosting sites. As a result, cormorants are rarely distributed evenly over a given region, but rather tend to be highly clumped or localized. Damage abatement activities can shift bird activities from one area to another, thereby not eliminating predation but only reducing damage at one site while increasing at another (Aderman and Hill 1995; Mott et al. 1998; Reinhold and Sloan 1999; Tobin et al. 2002). Thus, it is not uncommon for some fish farmers in a region to suffer little or no economic damage from cormorants, while others experience exceptionally high losses.

Price and Nickum (1995) conclude that the aquaculture industry has small profit margins so that even a small percentage reduction in the farm gate value due to predation is an economic issue. The magnitude of economic impacts that cormorants have on the aquaculture industry can vary depending upon many different variables, including the value of the fish stock, number of depredating birds present, and the time of year the predation is taking place.

Bioenergetics modeling on the impact of DCCO's on the Mississippi Delta catfish industry estimated that in 1989-90 and 1990-91, losses approximated 20 million and 18 million catfish fingerlings (10 to 20 cm), respectively (Glahn and Bruggers 1995). This was equivalent to approximately 4 percent of the fingerling class during the November to April study periods, representing approximately $2 million in fish losses. Although losses were documented over a six-month period, the majority (about 64-67 percent) occurred in February and March (Glahn and Bruggers 1995). Based upon the recent doubling in the wintering cormorant population in Mississippi, Glahn et al. (2000b) used this same model to predict current predation rates on fingerling catfish in the delta region. They estimated, on an annual basis, current cormorant predation losses resulted in the removal of 49 million fingerlings valued at $5 million. Glahn et al. (1999) states that as much as 75% of the diet of cormorants in certain roosting areas of the Mississippi delta consisted of catfish, and according to bioenergetic models cormorants can exploit as much as 940 metric tons of catfish per winter.

Controlled experiments by Glahn et al. (2002) investigating predation losses by cormorants confirm previous estimates of cormorant damage and have started to examine output parameters at harvest with and without cormorant predation. Using sampling weights of fish inventoried from captive cormorant trials, Glahn et al. (2002) calculated a 19.6% biomass production loss from cormorant predation. At a commercial pond scale the 20% loss in production would correspond to a loss of 6800 kg valued at $10,500 or almost 5 times the value of the fingerlings lost. Using this

ratio, catfish production losses to Mississippi Delta catfish farmers may currently approach $25 million or 8.6% of all catfish sales in Mississippi per year (Glahn et al. 2002). Furthermore, Glahn et al. (2002) examined the economic effects of cormorant predation on net returns in an enterprise budget for an average 130 ha catfish farm using data collected from captive cormorant trials and standard budgeting techniques. Enterprise budgets resulted in a 111% loss of profits based upon a 20% production loss observed at harvest from simulating 30 cormorants feeding at a 6 hectare catfish pond for 100 days.

1.2.2 Need for CDM to Protect Fishery Resources

The rapid increase in double-crested cormorant populations over the last 25 years has led to an increase in conflicts between humans and cormorants including those associated with sport fisheries (USFWS 2003). Double-crested cormorants are opportunistic feeders and therefore feed on a wide diversity of fish species dependant upon location (USFWS 2003). In the southeastern U.S. most of their diet consists of shad, catfish, and sunfish species (Wires et al. 2001). However, cormorants can have a negative impact on recreational fishing on a localized level (USFWS 2003). The degree of the effects of DCCO predation on fish in a given body of water is dependent on a number of variables, including the number of birds present, the time of year at which predation is occurring, prey species composition, and physical characteristics such as depth or proximity to shore (which affect prey accessibility). Environmental and human-induced factors affect aquatic ecosystems as well. These can be classified as biological/biotic (overexploitation, exotic species, etc.), chemical (water quality, nutrient and contaminant loading, etc.) or physical/abiotic (dredging, dam construction, hydropower operation, siltation, etc.). Such activities may lead to changes in species density, diversity, and/or composition due to direct effects on year class strength, recruitment, spawning success, spawning or nursery habitat, and/or competition (USFWS 1995).

The following is an example of the impacts that DCCOs can have on a localized sport fish population.

> *DCCO impacts on yellow perch in Les Cheneaux, Michigan*
> Yellow perch populations have been declining in many areas of the Great Lakes for several decades, most likely as a result of repeated recruitment failures (Lucchesi 1988, Haas and Schaeffer 1992). Fisheries managers and sport anglers are both concerned that predation pressure from the abundant and growing populations of DCCOs will either contribute to the further decline of yellow perch fisheries or prevent its recovery (Diana and Maruca 1997, Fielder In press). Since the late 1970s, the yellow perch fishery in the Les Cheneaux Islands, Michigan has experienced a marked decline (Lucchesi 1988), with the fishery remaining relatively stable through the mid 1990s and then abruptly declined to a near total collapse in 2000 (Fielder In press). Les Cheneaux Islands is located in northern Lake Huron and had for decades been economically important to the area (Diana et al. 1987). The waters of the Les Cheneaux Islands comprise a dynamic area of physical and biological complexity with both natural and human induced factors potentially affecting the fisheries resource in the area (USFWS 2003). However, despite the recent collapse in angler harvest and fishing pressure, the total annual mortality rate in yellow perch has remained high, ranging from 67% to 78% from 1997 through 2002. During this same time period mean age of perch has also declined from 4.5 years to 1.5 years (Fielder In press). Concurrent with the decline and collapse of the fishery and loss of perch in certain areas of the islands, was the proliferation of cormorants nesting in the area (Fielder In press). Nesting populations in the area have increased nearly 6 fold since the early 1990's to a local breeding population of over 5,500 nests in 2002 (Fielder In press).
>
> As described by USFWS (2003), fisheries investigations carried out in 1995 concurrently

with DCCO diet investigations in the Les Cheneaux Islands area found that DCCOs removed only 2.3% of the available yellow perch biomass and accounted for less than 20% of the total annual mortality of perch during that year. Overall, cormorants accounted for 0.8% of the mortality of legal-sized perch (178 mm), whereas summer sport fishing accounted for 2.5%. The conclusion was that DCCOs had minimal impact on the local perch population during that year because of the relatively high abundance of perch and because their predation was buffered for much of the year by abundant alewives (*Alsoa pseudoharengus*) (Fielder In press, USFWS 2003). However, in the late 1990s the abundant populations of alewives that were fed upon by cormorants during the 1995 study became scarce raising the question of whether cormorant predation on perch may have been greater than previously measured (Fielder In press). Fielder (In press) speculates that the timing of the rise in the DCCO population coincides closely with the collapse of the yellow perch fishery and such a predation scenario would account for the continued high total annual mortality rate and decline in mean perch age. Fielder further concludes that these data indicate that the collapse of the fishery and range contraction of perch were caused at least in part by the predatory effects of cormorants and that DCCOs may be contributing to the ongoing suppression of the perch population in the region.

Many of the inland lakes in the southeastern U.S. are reservoirs that were created for purposes such as flood control, water conservation, irrigation, and other beneficial uses such as recreational fishing. Concerns among anglers regarding DCCO predation on reservoir fishes in the southeastern States have increased in recent years (Simmonds et al. 1995). Recreational fishing benefits local and regional economies in many areas of the U.S. As participation in a recreational fishery increases, so does the total amount of money entering local and regional economies as angler expenditures. In this way, growth of recreational fishing can stimulate economic activity (Royce 1987 in Ross 1997).

The impacts that cormorants may be having on the sport fishery resources in the southeast, including Alabama, have not been thoroughly documented. Based upon survey information provided by Wires et al. (2001), biologist's perception of cormorant impacts to sport fisheries varies throughout the region, with Alabama respondents reporting impacts as a moderate concern in the state. WS has received requests for assistance from local homeowner associations to protect recreational fisheries in Alabama on their properties. The Alabama Wildlife Services program frequently works with stakeholders experiencing DCCO damage to private fishery resources and property. In FY 2004 Alabama WS provided assistance to 77 stakeholders with DCCO problems to private property (including sport fish). In addition, USFWS depredation permits were issued to numerous individuals and businesses to help protect private sport fish resources and property in Alabama. The Alabama WS program also works with Alabama Department of Conservation & Natural Resources (ADC&NR) annually to manage cormorant problems on state and federally owned or managed lakes and rivers throughout the state.

There is great concern among sport fish enthusiasts in northeast Alabama along the Tennessee River watershed that the ever increasing population of both wintering and most recently nesting DCCO will negatively affect sport fish populations in the large reservoirs (Mitch Adams, TVA, pers. Comm., 2003, Scott Atkins, TVA, pers. Comm., 2004).

1.2.3 Need for CDM to Protect Wildlife and Native Vegetation, Including T&E Species

Some of the species listed as threatened or endangered under the Endangered Species Act of 1973 are preyed upon or otherwise adversely affected by certain bird species, including double-crested cormorants (USFWS 2003). Double-crested cormorants are known to have a negative impact on wetland habitats (Jarvie et al. 1999, Shieldcastle and Martin 1999) and wildlife, including threatened and endangered species (Korfanty et al. 1999).

Cormorants can have a negative impact on vegetation by both chemical (cormorant guano) and physical means (stripping leaves and breaking tree branches) and such impacts are of concern in Alabama (USFWS 2003). Accumulation of cormorant droppings (which contribute excessive ammonium nitrogen), stripping leaves for nesting material, and the combined weight of the birds and their nests can break branches and ultimately kill many trees within 3 to 10 years (Bedard et al. 1995, Korfanty et al. 1999, Lemmon et al. 1994, Lewis 1929, Weseloh et al.1995, Weseloh and Ewins 1994, Weseloh and Collier 1995). Lewis (1929) considers the killing of trees by nesting cormorants to be very local and limited, with most trees he observed to have no commercial timber value. However, tree damage may be perceived as a problem if these trees are rare species, or aesthetically valued (Hatch and Weseloh 1999). Colonial waterbirds can be displaced by vegetation damage caused by cormorants (USFWS 2003). Double-crested cormorants can displace colonial species such as black-crowned night herons, egrets, great blue herons, gulls, common terns, and Caspian terns through habitat degradation and nest site competition (USFWS 2003). Cuthbert et al. (2002) examined potential impacts of DCCO's on great blue herons and black-crowned night-herons in the Great Lakes and found that DCCO's have not negatively influenced breeding distribution or productivity of either species at a regional scale but did contribute to declines in heron presence or site abandonment in certain site specific circumstances. Furthermore, Cuthbert et al. (2002) did find that DCCO's have negative impacts on normal plant growth and survival on a localized level in the Great Lakes region.

Double-crested cormorants can displace colonial bird species through habitat degradation and nest site competition (USFWS 2003, Harper 1993, NYSDEC 2000). Similar observations have been made on TVA owned and managed lands in northeast Alabama (Scott Atkins, TVA, pers. Comm., 2004, Robert Richey, WS, pers. Comm., 2004). Based upon survey information provided by Wires et al. (2001), biologists in the southeastern U.S, including Alabama, reported cormorants as having an impact to vegetation in the region. In addition survey respondents in the southeastern U.S. reported only minor concerns with the potential impacts that cormorants may be having on colonial waterbirds in this region (Wires et al. 2001). Currently impacts to T&E species in Alabama is of minor concern. Federal and state entities have contacted WS with concerns of habitat damage caused by roosting and nesting cormorants in Alabama. These entities have expressed concerns of potential impacts to nesting colonial waterbirds and potential damage to native tree species and the devaluing of property. There is particular concern with the damage caused to numerous islands along the Tennessee River watershed in northeast Alabama (Scott Atkins, TVA, pers. Comm., 2004, Keith McCutcheon, ADC&NR, pers. Comm., 2004). As the trees are destroyed and topple on one island used by DCCO they simply move to another, previously unaffected island and the process repeats itself. After only two years of use of an island by roosting DCCO the trees die, start toppling, and allow wave action to severely erode the perimeter of the once pristine island. After four years since the DCCO began using the island little if any standing trees remain, the understory vegetation too is dead, and the wave action has eroded islands severely as toppling trees uproot large clumps of soil with their roots; the roots which once bound soil along the banks are either dead with the vegetation or uprooted and can no longer bind the soil along the shoreline (Scott Atkins, TVA, pers. Comm.). The islands are aesthetically very important to the region, for homeowners and the various recreational users of the waters.

In recent years, private landowners and waterfowl hunting clubs have requested CDM assistance because of the negative effects that large concentrations of DCCO's may be having on other waterfowl. Waterfowl hunters often complain that DCCO use interferes with duck use patterns when these species try to utilize the same areas. Observations suggest that ducks and geese will be displaced from habitats utilized by DCCO's. Conflicts between DCCO's and waterfowl typically occur in bald cypress (*Taxodium distichum*) and tupelo gum (*Nyssa aquatica*) habitats.

1.2.4 Need for CDM to Protect Property

Birds frequently damage structures on private property, or public facilities, with fecal contamination. Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosion damage to metal structures and painted finishes, including those on automobiles and boats, can occur because of uric acid from bird droppings. Property losses associated with cormorants include impacts to privately-owned lakes that are stocked with fish; damage to boats and marinas or other properties found near cormorant breeding or roosting sites; and damage to vegetation on privately-owned land (USFWS 2003).

Homeowner associations have requested assistance from WS in Alabama to address concerns of property damage. These concerns are mainly centered on the destruction of trees through high numbers of roosting cormorants, but also include concerns of impacts to privately owned fish stocks.

1.2.5 Need for CDM to Protect Human Health and Safety

Cormorants are a potential risk to human health and human safety (USFWS 2003). Of greatest concern are the potential impacts that cormorants may have on water quality and the aviation communities.

Human Health Risks

Concerns about water quality and DCCOs exist on two levels: contaminants and pathogens (USFWS 2003). Waterbird excrement can contain coliform bacteria, streptococcus bacteria, Salmonella, toxic chemicals, and nutrients, and it is known to compromise water quality, depending on the number of birds, the amount of excrement, and the size of the water body. Elevated contaminant levels associated with breeding and/or roosting concentrations of DCCOs and their potential effects on groundwater supplies are the major concerns regarding DCCO impacts to human health.

Airport Safety

It is widely recognized throughout the civil and military aviation communities that the threat to human health and safety from aircraft collisions with wildlife is increasing (Dolbeer 2000). Collisions between aircraft and wildlife are a concern throughout the world because they threaten passenger safety (Thorpe 1996), result in lost revenue and costly repairs to aircraft (Linnell et al. 1996, Robinson 1996), as well as erode public confidence in the air transport industry as a whole (Conover et al. 1995).

All birds are potentially hazardous to aircraft and human safety. The hazard potential is dependent on the physical, biological, and behavioral characteristics of each bird. Cormorants are a particular hazard to aircraft because of their body size and mass, slow flight speeds, and their natural tendency to fly in flocks. Blockpoel (1976) states that birds with slow flight speeds can create increased hazards to aircraft because they spend relatively greater lengths of time in aircraft movement areas. There is a very strong relationship between bird weight and the probability of plane damage (Anonymous 1992; Dolbeer et al. 2000). For example, there is a 90% probability of plane damage when the bird weighs 70 or more ounces (4 1/3 pounds) versus a 50% probability of plane damage for a 6 ounce (1/3 pound) bird (Anonymous 1992). Adult DCCOs can weigh up to more than 6 pounds (Terres 1980).

According to Federal Aviation Administrations Bird Strike Database FAA Aircraft/Wildlife strike data there were 16 wildlife strikes involving cormorants to civil aircraft in the U.S. from 1990-1999 (USFWS 2003). In October, 2002 at Logan International Airport (Boston, MA), a B-767 struck a flock of double-crested cormorants, resulting in an engine shut down, precautionary landing, and damage to the engine and landing lights. The aircraft was out of service for 3 days, and repairs cost $1.7 million (Wright 2003). It is estimated that only 20 - 25% of all bird strikes are reported (Conover et al. 1995; Dolbeer et al. 1995; Linnell et al. 1996; Linnell et al. 1999),

hence, the number of strikes involving double-crested cormorants is likely greater than Federal Aviation Administration records show.

WS recognizes that the risk to aircraft safety associated with DCCOs is low. To date, Alabama WS program has not received any requests for assistance with reducing concerns of cormorants affecting aircraft safety. However, due to the fact that DCCO roosting and feeding sites are found in close proximity to some airports and military airbases in Alabama, it is possible that WS may receive requests for assistance in the future. WS may provided such assistance if requested by the WS program in Alabama.

1.3 WS RECORD KEEPING REGARDING REQUESTS FOR CORMORANT DAMAGE MANAGEMENT ASSISTANCE

WS maintains a Management Information System (MIS) database to document assistance that the agency provides in addressing wildlife damage conflicts. MIS data is limited to information that is collected from people who have requested services or information from Wildlife Services. It does not include requests received or responded to by local, State or other Federal agencies, and it is not a complete database for all wildlife damage occurrences. The number of requests for assistance does not necessarily reflect the extent of damage or the need for action, but these data do provide an indication that needs exist.

The database includes, but is not limited to, the following information: species of wildlife involved; the number of individuals involved in a damage situation; tools and methods used or recommended to alleviate the conflict; and the resource that is in need of protection. Table 1-1 provides a summary of Technical Assistance projects completed by the Alabama WS program for Fiscal Year 1998-2004. A description of the WS Direct Control and Technical Assistance programs are described in Chapter 3 of this EA.

Table 1-1. Number of incidents for cormorant technical assistance for Alabama Wildlife Services, by Fiscal Year.

Fiscal Year	Aquaculture	Property	Health & Safety	Natural Resources	Other
1998	15	0	1	1	8
1999	8	1	0	1	11
2000	9	0	0	1	9
2001	13	0	0	4	16
2002	17	1	0	5	17
2003	18	0	0	1	5
2004	62	1	1	6	7
Total	142	3	2	19	73

1.4 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

ADC Programmatic Environmental Impact Statement. WS has issued a Final EIS (FEIS) on the national APHIS/WS program (USDA 1997). Pertinent and current information available in the EIS has been incorporated by reference into this EA. The FEIS may be obtained by contacting the USDA, APHIS, WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

Final Environmental Impact Statement: Double-crested Cormorant Management in the United States. The USFWS has issued a Final EIS (FEIS) on the management of double-crested cormorants

(USFWS 2003). WS was a formal cooperating agency in the preparation of the FEIS and has adopted the EIS to support WS' program decisions for its involvement in the management of DCCO damage. WS completed a Record of Decision (ROD) on November 18, 2003 (68 Federal Register 68020). This EA is tiered to that FEIS. Pertinent and current information available in the EIS has been incorporated by reference into this EA. The FEIS may be obtained by contacting the Division of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, MBSP-4107, Arlington, Virginia 22203 or by downloading it from the USFWS website at http://migratorybirds.fws.gov/issues/cormorant/cormorant.html. WS ROD may be viewed at http://www.aphis.usda.gov/ws/pubs.html.

1.5 DECISION TO BE MADE

Based on the scope of this EA, the decisions to be made are:

- Should WS implement a CDM program including winter roost control and implementation of the PRDO?
- If not, how should cormorant damage and conflicts in the State be managed and what role should WS play in this?
- Might the proposed program have significant effects requiring preparation of an EIS?

1.6 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

1.6.1 Actions Analyzed

This EA evaluates double-crested cormorant damage management by WS to protect aquaculture, property, natural resources, and human health and safety on private and public land or facilities within the State wherever such management is requested from the WS program.

1.6.2 Period for Which this EA is Valid

This EA would remain valid until Alabama WS and other appropriate agencies determine that new needs for action, changed conditions, and/or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be supplemented pursuant to NEPA. Review of the EA would be conducted each year to ensure that the EA is sufficient.

1.6.3 American Indian Tribes and Land

Currently, Alabama WS does not have any MOU's with any American Indian Tribes. If WS enters into an agreement with a tribe for CDM, this EA would be reviewed and supplemented if appropriate to insure compliance with NEPA. MOU's, agreements and NEPA compliance would be conducted as appropriate before conducting CDM on tribal lands.

1.6.4 Site Specificity

This EA analyzes potential effects of WS's CDM activities that will occur or could occur at private and public property sites or facilities within Alabama. It also addresses the impacts of CDM in areas where additional agreements may be signed in the future. Because the proposed action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional CDM efforts could occur. Thus, this EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program.

Planning for the management of cormorant damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences

from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, etc. Although some of the sites where cormorant damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. The EA emphasizes important issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of cormorant damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 is the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS in the State (See USDA 1997 and Chapter 2 for a more complete description of the WS Decision Model as well as examples of its application). Decisions made using this thought process will be in accordance with any mitigation measures and standard operating procedures described herein and adopted or established as part of the decision.

The analyses in this EA are intended to apply to any action that may occur *in any locale* and at *any time* within Alabama. In this way, APHIS-WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish its mission.

1.6.5 Summary of Public Involvement

Issues related to the proposed action were initially developed by WS. In part, WS used the USFWS cormorant FEIS (2003) to further define the issues and identify preliminary alternatives. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Authority of Federal and State Agencies in Cormorant Damage Management in Alabama[2]

Wildlife Services Legislative Authority. The USDA is directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the Wildlife Services program is the Act of March 2, 1931 (7 U.S.C. 426-426c; 46 Stat. 1468), as amended in the Rural Development, Agriculture, Related Agencies Appropriations Act of 1988, Public Law 100-102, Dec. 27, 1987. Stat. 1329-1331 (7 U.S.C. 426c), and the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act of 2001, Public Law 106-387, October 28, 2000. Stat. 1549 (Sec 767), which provides that:

> *"The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001."*

Since 1931, with the changes in societal values, WS policies and its programs place greater

[2]See Chapter 1 of USDA (1997) for a complete discussion of Federal laws pertaining to WS.

emphasis on the part of the Act discussing "bringing (damage) under control", rather than "eradication" and "suppression" of wildlife populations. In 1988, Congress strengthened the legislative directive and authority of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

> *"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammals and birds species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."*

U.S. Fish and Wildlife Service (USFWS). The USFWS is responsible for managing and regulating the take of bird species that are listed as migratory under the Migratory Bird Treaty Act (MBTA) and those that are listed as threatened or endangered under the Endangered Species Act (ESA).

U.S. Tennessee Valley Authority (TVA). Tennessee Valley Authority, a federal corporation created by an Act of Congress in May 18, 1933 [48 Stat. 58-59, 16 U.S.C. Sec. 831, as amended], provides electrical power to 8.3 million people, businesses, and industries and manages 293,000 acres of public land and 11,000 miles of reservoir shoreline in the 7-state Tennessee Valley region.

Alabama Department of Conservation & Natural Resources (ADC&NR) Legislative Mandate. The mission of the Wildlife and Freshwater Fisheries Division is to manage, protect, conserve, and enhance the wildlife and aquatic resources of Alabama for the sustainable benefit of the people of Alabama.

The Code of Alabama – Title 9 (Conservation and Natural Resources) Article 1, Sections 9-2-2, 9-2-7 and 9-2-8, cumulatively and in-part state "the Commissioner of Conservation and Natural Resources is vested with the power to enforce and administer all laws providing for the preservation, protection, propagation and development of wild birds, wild furbearing animals, game fish, saltwater fish, shrimp, oysters and other shellfish, crustaceans and all other species of wildlife within the state or within the territorial jurisdiction of the state which have not been reduced to private ownership, except as otherwise provided

Although many legal mandates concerning powers and duties of the Commissioner and ADC&NR are expressed throughout the Code of Alabama – Title 9, Article 1, of particular interest here is Section 9-2-2, Powers and Duties Generally, item (5):

> "To cooperate with and enter into cooperative agreements and stipulations with the Secretary of Agriculture of the United States or any other federal officer or department, board, bureau, commission, agency or office thereunto authorized with respect to wildlife restoration projects, the carrying on of an educational program in connection therewith, the collection and publication of data with respect to wildlife, state parks and the monuments and historical sites or any other matters committed to the Department of Conservation and Natural Resources by this title and to make and enforce all regulations and restrictions required for such cooperation, agreements or stipulations."

ADC&NR currently has a MOU with WS. The document establishes a cooperative relationship among WS and ADC&NR. Responsibilities include planning, coordinating, and implementing policies to address wildlife damage management and facilitating exchange of information.

1.7.2 Compliance with Other Federal Laws

Several other Federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act. WS prepares analyses of the environmental effects of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action in Alabama. When WS operational assistance is requested by another Federal agency, NEPA compliance is the responsibility of the other Federal agency. However, WS could agree to complete NEPA documentation at the request of the other Federal agency.

Endangered Species Act (ESA). It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the U.S. Fish & Wildlife Service to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available" (Sec.7 (a)(2)). WS obtained a Biological Opinion (B.O.) from USFWS in 1992 describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F).

As part of the cormorant FEIS (USFWS 2003), the USFWS completed an intra-Service biological evaluation and informal Section 7 consultation on the management of double-crested cormorants in the U.S.

Migratory Bird Treaty Act of 1918 (16 U.S.C. 03-711; 40 Stat. 755), as Amended. The Migratory Bird Treaty Act provides the USFWS regulatory authority to protect families of birds that contain species which migrate outside the United States. The law prohibits any "*take*" of these species by any entities, except as permitted or authorized by the USFWS.

The USFWS issues permits to requesters for reducing migratory bird damage in certain situations. WS provides on-site assessments for persons experiencing migratory bird damage to obtain information on which to base damage management recommendations. Damage management recommendations could be in the form of technical assistance or operational assistance. In severe cases of migratory bird damage, WS provides recommendations to the USFWS for the issuance of depredation permits to private entities or other agencies. The ultimate responsibility for issuing such permits rests with the USFWS. WS will obtain MBTA permits covering DCCO damage management activities that involve the taking of species for which such permits are required in accordance with the MBTA and USFWS regulations, or will operate as a named agent on MBTA permits obtained by cooperators.

A recent court case involving mute swans held that the MBTA must provide protection to individual non-native species found within the United States that belong to families of birds already protected under the Act. As a result, many other species in addition to the mute swan became eligible for protection under the MBTA that had previously been excluded. Thus, the Migratory Bird Treaty Reform Act of 2004 was passed to clarify the original intent of the MBTA, the conservation and protection of migratory birds native to North America, and directed USFWS to establish a list of non-native bird species found in the United States. Species on this list, including mute swans, will not be afforded MBTA protection. Certain bird species in North America are not protected under the MBTA because neither the species nor their family was listed in the MBTA. All actions conducted in this EA will be in compliance with the regulations of the MBTA, as amended.

WS also assists aquaculture producers in meeting USFWS "non-lethal certification" requirements as specified in the Aquaculture Depredation Order (50 CFR 21.47). Specifically the requirement mandates persons using the depredation order to have an established non-lethal harassment program in place as certified by WS (50 CFR 21.47(3)(d)).

Executive Order 13186 of January 10, 2001 "Responsibilities of Federal Agencies to Protect Migratory Birds." This Order states that each federal agency, taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations, is directed to develop and implement, a MOU with the USFWS that shall promote the conservation of migratory bird populations. WS has developed a draft MOU with the USFWS as required by this Order and is currently waiting for USFWS approval. WS will abide by the MOU once it is finalized and signed by both parties.

The Native American Graves and Repatriation Act of 1990. The Native American Graves Protection and Repatriation Act require Federal agencies to notify the Secretary of the Department that manages the Federal lands upon the discovery of Native American cultural items on Federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

National Historic Preservation Act (NHPA) of 1966 as amended. The NHPA of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that have the potential to cause effects on historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the Advisory Council on Historic Preservation (i.e. State Historic Preservation Office, Tribal Historic Preservation Officers), as appropriate. WS actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties.

Each of the CDM methods described in this EA that might be used operationally by WS do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

There is potential for audible effects on the use and enjoyment of a historic property when methods such as propane exploders, pyrotechnics, firearms, or other noise-making methods are used at or in close proximity to such sites for purposes of hazing or removing birds. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage or nuisance problem, which means such use would be to benefit the historic property. A built-in mitigating factor for this issue is that virtually all of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary in those types of situations.

Environmental Justice and Executive Order 12898 - "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." Executive Order 12898, promotes the fair treatment of people of all races, income levels and cultures with

respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice (EJ) is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. EJ is a priority within APHIS and WS. Executive Order 12898 requires Federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

Protection of Children from Environmental Health and Safety Risks (Executive Order 13045). Children may suffer disproportionately from environmental health and safety risks for many reasons. CDM as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that children would be adversely affected. Therefore, implementation of the proposed action would not increase environmental health or safety risks to children.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of mitigation measures and/or standard operating procedures, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional descriptions of affected environments will be incorporated into the discussion of the environmental effects in Chapter 4.

2.1 AFFECTED ENVIRONMENT

The areas of the proposed action could include areas in and around public and private facilities and properties and at other sites where cormorants may roost, loaf, feed, nest or otherwise occur. Examples of areas where cormorant damage management activities could be conducted are, but are not necessarily limited to: commercial aquaculture facilities; fish hatcheries; lakes; ponds; rivers; swamps; marshes; bayous; communally-owned homeowner/property owner association properties; boat marinas; natural areas; wildlife refuges; wildlife management areas; coastal and tidal beaches and inlets; and airports and surrounding areas. The proposed action may be conducted on properties held in private, local, state or federal ownership. WS may conduct winter roost control activities in any cormorant roost site in Alabama, including the 36 roost sites currently identified throughout the state. Of these 36 roost sites, 10 are privately owned and 26 are publicly owned (see Appendix D). WS may also conduct control activities at breeding colonies located throughout the State, including those located in northeast Alabama, primarily on TVA administered lands. In the summers of 2003 and 2004, approximately 300 and 350 active cormorant nests, at five and four sites, respectively, were documented by WS and TVA personnel.

Note that the location and the number of roosts used by DCCO (particularly near aquaculture facilities) are dynamic and ever changing. As birds are harassed at one roost they often simply start roosting at another location in close proximity to their former site. Often times they relocate to historic roosts and often they "create" new ones. In 2001 Alabama had approximately 18 roosts near aquaculture facilities in west-central Alabama; after the 2005 season that has climbed to approximately 29.

2.2 SUMMARY OF ISSUES

The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

- Effects on double-crested cormorant populations
- Effects on other wildlife species, including T&E species
- Effects on human health and safety
- Effects on aesthetic values
- Humaneness and animal welfare concerns of the methods used

2.2.1 Effects on Double-crested Cormorant Populations

A common concern among members of the public is whether wildlife damage management actions adversely affect the viability of target species populations. The target species selected for analysis in this EA is the double-crested cormorant (*Phalacrocorax auritus*).

Impacts of West Nile virus on bird populations

West Nile (WN) virus has emerged in recent years in temperate regions of North America, with the first appearance of the virus in North America occurring in New York City in 1999 (MMWR

2002, Rappole et al. 2000). Since 1999 the virus has spread across the United States and was reported to occur in 44 states and the District of Columbia in 2002 (MMWR 2002). West Nile virus is typically transmitted between birds and mosquitoes. Mammals can become infected if bitten by an infected mosquito, but individuals in most species of mammals do not become ill from the virus. The most serious manifestation of the WN virus is fatal encephalitis in humans, horses, and birds. West Nile virus has been detected in dead bird species of at least 138 species, including DCCOs (CDC 2003). Although birds infected with WN virus can die or become ill, most infected birds do survive and may subsequently develop immunity to the virus (CDC 2003, Cornell University 2003). In some bird species, particularly Corvids (crows, blue jays, ravens, magpies), the virus causes disease (often fatal) in a large percentage of infected birds (Audubon 2003, CDC 2003, Cornell University 2003, MMWR 2002). In 2002, WN virus surveillance/monitoring programs revealed that Corvids accounted for 90% of the dead birds reported with crows representing the highest rate of infection (MMWR 2002). Large birds that live and die near humans (i.e. crows) have a greater likelihood of being discovered, therefore the reporting rates tend to be higher for these bird species and are a "good indicator" species for the presence of WV virus in a specific area (Cornell University 2003, Audubon 2003). According to US Geological Survey (USGS), National Wildlife Health Center (2003), information is not currently available to know whether or not WN virus is having an impact on bird populations in North America. USGS states that it is not unusual for a new disease to cause high rates of infection or death because birds do not have the natural immunity to the infection. Furthermore, it is not known how long it will take for specific bird population to develop sufficient immunity to the virus. Surveys of wild birds completed in the last three years have shown that some birds have already acquired antibodies to the virus (USGS-WHC 2003). Based upon available Christmas Bird Counts and Breeding Bird Surveys, USGS-WHC (2003) states that there have been declines in observations of some local bird populations, however they do not know if the decline can be attributed to WN virus or to some other cause. A review of available crow population data by Audubon (2003) reveals that at least some local crow populations are suffering high WN virus related mortality, but crow numbers do not appear to be declining drastically across broad geographic areas. USGS does not anticipate that the commonly seen species, such as crows and blue jays, will be adversely affected by the virus to the point that these bird species will disappear from the U.S. (USGS-WHC 2003).

2.2.2 Effects on other Wildlife Species, Including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the impact of CDM methods and activities on nontarget species, particularly T&E species. WS's standard operating procedures (SOPs) include measures intended to mitigate or reduce the effects on nontarget species populations and are presented in Chapter 3. To reduce the risks of adverse effects to nontarget species, WS would select damage management methods that are target-selective or apply such methods in ways to reduce the likelihood of capturing or killing nontarget species.

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act concerning potential effects of CDM methods on T&E species and has obtained a Biological Opinion. For the full context of the Biological Opinion, see Appendix F of the ADC FEIS (USDA 1997, Appendix F). WS is also in the process of reinitiating Section 7 consultation at the program level to assure that potential effects on T&E species have been adequately addressed.

As part of the cormorant FEIS (USFWS 2003), the USFWS completed an intra-Service biological evaluation and informal Section 7 consultation on the management of double-crested cormorants in the U.S. As stated in WS cormorant ROD (68 Federal Register 68020), applicable conservation measures identified in the FEIS have been incorporated into the Alabama WS' CDM program (see

Section 4.1.2).

Some nontarget species, including colonial waterbirds, may actually benefit from CDM. As described in Sections 1.2.3 and 3.2.3, in limited circumstances, colonial waterbirds can benefit from reductions in cormorant populations, which may compete for nesting space and destroy nesting habitat.

2.2.3 Effects on Human Health and Safety

2.2.3.1 Effects on Human Health and Safety from CDM Methods

Some people may be concerned that WS's use of CDM methods, such as firearms and pyrotechnic scaring devices, could cause injuries to people. WS personnel occasionally use rifles and shotguns to remove or scare cormorants that are causing damage. Shotguns may also be used on airports to scare or remove birds which pose a threat to aircraft or air passenger safety. WS frequently uses pyrotechnics in noise harassment programs to disperse or move birds. There is some potential fire hazard to agricultural sites and private property from pyrotechnic use.

Firearm use is very sensitive and a public concern because of safety relating to the public, and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards. WS employees who carry firearms as a condition of employment are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

2.2.3.2 Effects on Human Health and Safety from Not Conducting CDM

The concern stated here is that the absence of adequate CDM would result in adverse effects on human health and safety, because cormorant damage would not be curtailed or reduced to the minimum levels possible and practical. The potential impacts of not conducting such work could lead to increased incidence of injuries, illness, or loss of human lives.

Airport managers and air safety officials are concerned that the absence of a WS CDM program could lead to a failure to adequately address complex wildlife hazard problems faced by the aviation community. Hence, potential effects of not conducting such work could lead to an increased incidence of human injuries or loss of life due to cormorant bird strikes to aircraft.

2.2.4 Effects on Aesthetic Values

Aesthetics is a philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is subjective in nature and is dependent on what an observer regards as beautiful. The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception, and today a large percentage of households have pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife.

There may be some concern that the proposed action or alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using the animal or intending to) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Many people, directly affected by problems and threats to public health or safety associated with wildlife, insist upon their removal from the property or public location when they cause damage. Some members of the public have an idealistic view and believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to public health or safety. Others, directly affected by the problems caused by wildlife, strongly support removal. Individuals not directly affected by the harm or damage caused by wildlife may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Those totally opposed to wildlife damage management want WS to teach tolerance for damage and threats to public health or safety, and that wildlife should never be killed. Some people would strongly oppose removal of wildlife regardless of the amount and type of damage. Some members of the public who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

The WS program in Alabama only conducts CDM at the request of the affected property owner or resource manager. If WS received requests from an individual or official for CDM, WS would address the issues/concerns and consideration would be made to explain the reasons why the individual damage management actions would be necessary. Management actions would be carried out in a caring, humane, and professional manner.

2.2.5 Humaneness and Animal Welfare Concerns of Methods Used

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if "*. . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.*"

Suffering is described as a "*. . . highly unpleasant emotional response usually associated with pain and distress.*" However, suffering "*. . . can occur without pain . . . ,*" and "*. . . pain can occur without suffering . . .*" (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for "*. . . little or no suffering where death comes immediately . . .*" (CDFG 1991), such as shooting.

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would "... *probably be causes for pain in other animals* ..." (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (CDFG 1991).

Pain and suffering, as it relates to WS damage management methods, have both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since "... *neither medical or veterinary curricula explicitly address suffering or its relief*" (CDFG 1991).

Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some CDM methods are used in situations where non-lethal damage management methods are not practical or effective.

Alabama WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding. Mitigation measures/SOPs used to maximize humaneness are listed in Chapter 3.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

2.3.1 Appropriateness of Preparing an EA (Instead of an EIS) for Such a Large Area

Some individuals might question whether preparing an EA for an area as large as Alabama would meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of Federal or other agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. The WS program is analogous to other agencies or entities with damage management missions such as fire and police departments, emergency clean-up organizations, insurance companies, etc. Although WS can predict some of the possible locations or *types* of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a cormorant damage problem has become intolerable to the point that they request assistance from WS. Nor would WS be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and State agencies. Such broad scale population control would also be impractical, or impossible, to achieve.

If a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative effects, one EA analyzing impacts for the entire State may provide a better analysis than multiple EA's covering smaller zones.

2.3.2 WS's Effect on Biodiversity

The WS program does not attempt to eradicate any native species of wildlife in Alabama. WS

operates in accordance with International, Federal and State laws, and regulations enacted to ensure species viability. Effects on target and nontarget species populations because of WS's lethal CDM activities are minor, as shown in Section 4.1.1 and 4.1.2. The effects of the WS program on biodiversity are not significant nationwide or statewide (USDA 1997).

2.3.3 Wildlife Damage is a Cost of Doing Business — a "Threshold of Loss" Should Be Established Before Allowing Any Lethal CDM

WS is aware that some people feel Federal wildlife damage management should not be allowed until economic losses reach some arbitrary predetermined threshold level. Such policy, however, would be difficult or inappropriate to apply to human health and safety situations. Although some damage can be tolerated by most resource owners, resource owners and situations differ widely and a set wildlife damage threshold levels would be difficult to determine or justify. WS has the legal direction to respond to requests for assistance, and it is program policy to aid each requester to minimize losses. WS uses the Decision Model thought process discussed in Chapter 3 to determine appropriate strategies.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie National Forest, et al., the United States District Court of Utah denied plaintiffs' motion for preliminary injunction. In part the court found that a forest supervisor needs only show that damage from wildlife is threatened, to establish a need for wildlife damage management (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as percentage of loss of a particular resource to justify the need for wildlife damage management actions.

2.3.4 Effect of WS's Winter Roost Control Program on Waterfowl Hunting

Waterfowl hunting is an outdoor activity that is pursued and enjoyed by many people in Alabama during the fall and winter months. Waterfowl hunting in Alabama occurs in a variety of natural and human induced habitat types (bayous, streams, lakes, flooded fields, flooded timber, waterfowl impoundments, etc.), including those that may used by wintering DCCOs. Conflicts with hunters may occur when DCCO's occupy winter waterfowl habitat in close proximity to aquaculture facilities or other resources being negatively impacted by DCCO's. Due to this association WS may be requested to conduct CDM activities in areas that are used for waterfowl hunting.

To alleviate potential impacts to waterfowl hunting WS will abide by the following mitigation measures:

- WS will acquire the necessary landowner permission prior to conducting CDM activities
- WS will involve the affected hunters in the decision making process including when, where and how CDM actions will be taken.
- Winter roost activities will be conducted in such a manner to limit potential exposure to wintering waterfowl. This may include, but is not necessarily limited to, dispersing incoming flight lines of DCCO's prior to entering a roost site; dispersing DCCO roost sites as soon as they form in the fall to condition DCCO's to avoid these sites later in the year when waterfowl are present; do not disperse DCCO roosts until substantial numbers (200+) birds begin to occupy the roosting site; use minimal amount of noise harassment devices necessary to effectively disperse a roost; and when possible begin activities early in afternoon to avoid potential conflicts with night roosting waterfowl.

WS adherence to these mitigation measures should assure that WS CDM activities will have minimal impacts on waterfowl hunting opportunities throughout Alabama.

CHAPTER 3: ALTERNATIVES

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992); Appendix J ("*Methods of Control*"), Appendix N ("*Examples of WS Decision Model*"), and Appendix P ("*Risk Assessment of Wildlife Damage Control Methods Used by USDA, Wildlife Services Program*") of the ADC FEIS (USDA 1997); and Appendix 4 ("*Management Techniques*") of the USFWS Cormorant FEIS (USFWS 2003).

3.0 ALTERNATIVES ANALYZED IN DETAIL

Alternatives analyzed in detail are:

- Alternative 1 - Integrated CDM Program, including Winter Roost Control and PRDO (Proposed Action).
- Alternative 2 - Non-lethal CDM Only By WS.
- Alternative 3 - Technical Assistance Only.
- Alternative 4 - No Federal WS CDM. This alternative consists of no CDM program by WS.
- Alternative 5 – Integrated CDM Program, excluding Winter Roost Control and PRDO (No Action). This is the "No Action" alternative as defined by the Council on Environmental Quality

3.1 DESCRIPTION OF THE ALTERNATIVES

3.1.1 Alternative 1 - Integrated CDM Program, including Winter Roost Control and PRDO (Proposed Action)

WS proposes to implement a double-crested cormorant damage management program in the State of Alabama, including the implementation of the PRDO (50 CFR 21.48) and winter roost control as specified in the AQDO (50 CFR 21.47). An Integrated Wildlife Damage Management approach would be implemented to reduce cormorant damage and conflicts to aquaculture, property, natural resources, and human health and safety. Damage management would be conducted on public and private property in Alabama when the resource owner (property owner) or manager requests WS assistance. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion, habitat modification, or harassment would be recommended and utilized to reduce damage. In other situations, birds would be humanely removed through use of shooting, egg addling/destruction, nest destruction, or euthanasia following live capture. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where the application of lethal methods alone would be the most appropriate strategy. Wildlife damage management activities would be conducted in the State, when requested and funded, on private or public property, after an *Agreement for Control* or other comparable document has been completed. WS will acquire the necessary landowner permission prior to conducting cormorant damage management activities, including the appropriate landowner permission prior to conducting winter roost control. All management activities would comply with appropriate Federal, State, and Local laws, including applicable laws and regulations authorizing take of double-crested cormorants, and their nests and eggs.

3.1.2 Alternative 2 - Non-lethal CDM Only By WS

Under this alternative, WS would be restricted to implementing or recommending only non-lethal

methods in providing assistance with cormorant damage problems. Entities requesting CDM assistance for damage concerns would only be provided information on non-lethal methods such as harassment, non-lethal roost dispersal, resource management, exclusionary devices, or habitat alteration. However, it is possible that persons receiving WS' non-lethal technical and direct control assistance could still resort to lethal methods that were available to them. The ADC&NR and Indian Tribes would be able to implement the PRDO; the USFWS would continue to issue migratory bird permits to take DCCO's and their eggs; and aquaculture producers would continue to implement the AQDO. Information on lethal CDM methods would not be available from WS but would still be available through sources such as USDA Agricultural Extension Service offices, USFWS, ADC&NR, universities, or pest control organizations.

3.1.3 Alternative 3 - Technical Assistance Only

This alternative would not allow for WS operational CDM in Alabama. WS would only provide technical assistance and make recommendations when requested. Producers, property owners, agency personnel, or others could conduct CDM using any non-lethal or lethal method that is legally available to them. The ADC&NR and Indian Tribes would be able to implement the PRDO; the USFWS would continue to issue migratory bird permits to take DCCO's and their eggs; and aquaculture producers would continue to implement the AQDO. WS would not take part in winter roost control activities or implementation of the PRDO.

3.1.4 Alternative 4 - No Federal WS CDM

This alternative would eliminate WS involvement in CDM in Alabama. WS would not provide direct operational or technical assistance and requesters of WS services would have to conduct their own CDM without WS input. Information on CDM methods would still be available through other sources such as USDA Agricultural Extension Service offices, USFWS, ADC&NR, universities, or pest control organizations. The ADC&NR and Indian Tribes would be able to implement the PRDO; the USFWS would continue to issue migratory bird permits to take DCCO's and their eggs; and aquaculture producers would continue to implement the AQDO.

3.1.5 Alternative 5 - Integrated CDM Program, excluding Winter Roost Control and PRDO (No Action)

This alternative would be similar to Alternative 1, with the exception that WS will not take part in winter roost control activities and implementation of the PRDO. The ADC&NR and Indian Tribes would be able to implement the PRDO; the USFWS would continue to issue migratory bird permits to take DCCO's and their eggs; and aquaculture producers would continue to implement the AQDO. An Integrated Wildlife Damage Management approach would be implemented to reduce cormorant damage and conflicts to aquaculture, property, natural resources, and human health and safety. Damage management would be conducted on public and private property in Alabama when the resource owner (property owner) or manager requests WS assistance including the use of lethal and non-lethal methods. Under this action, WS could provide technical assistance and direct operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992).

3.2 CDM STRATEGIES AND METHODOLOGIES AVAILABLE TO WS IN ALABAMA

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2, 3 and 5 described above. Alternative 4 would terminate both WS technical assistance and operational CDM by WS. Appendix 4 of the USFWS cormorant FEIS (USFWS 2003) provides a more detailed description of the methods that could be used or recommended by WS.

3.2.1 Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective[3] manner while minimizing the potentially harmful effects on humans, target and nontarget species, and the environment. IWDM may incorporate cultural practices (e.g., fish husbandry), habitat modification (e.g., exclusion, vegetation management), animal behavior modification (e.g., scaring, roost dispersal), and removal of individual offending animals (e.g., shooting, live capture), local population reduction (e.g., shooting, nest and egg destruction), or any combination of these, depending on the circumstances of the specific damage problem.

3.2.2 The IWDM Strategies That WS Employs

Technical Assistance Recommendations

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application.

Under APHIS NEPA implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving cormorant damage problems.

Direct Damage Management Assistance

This is the implementation or supervision of damage management activities by WS personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when *Agreements for Control* or other comparable instruments provide for direct damage management by WS. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use chemicals are necessary, or if the problems are complex.

Educational Efforts

Education is an important element of WS program activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures, courses, and demonstrations are provided to producers, homeowners, state and county agents, colleges and universities, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are periodically updated on recent developments in damage management technology, programs, laws and regulations, and agency policies.

Research and Development

[3]The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns.

The National Wildlife Research Center (NWRC) functions as the research arm of WS by providing scientific information and development of methods for wildlife damage management that are effective and environmentally responsible. NWRC scientists work closely with wildlife managers, researchers, field specialists and others to develop and evaluate wildlife damage management techniques. NWRC scientists have authored hundreds of scientific publications and reports, and are respected world-wide for their expertise in wildlife damage management.

3.2.3 Examples of WS Direct Operational and Technical Assistance in CDM in Alabama

Management of Damage to Aquaculture

Alabama WS is currently cooperating with private aquaculture producers, ADC&NR, and other entities to resolve many problems caused by cormorants. Alabama WS also works closely with the NWRC Starkville Field Station (MS) to collect data and evaluate problems related to fish-eating birds.

Alabama WS currently utilizes two full time employees whose major duties are assisting with, and responding to, cormorant damage and predation issues; two additional part time employees are used during the winter months, primarily assisting with bird dispersal at aquaculture facilities and dispersing roosts at night. These issues are addressed through an integrated program for conducting cormorant damage management activities. The main emphasis in Alabama is focused on, but not limited to, the aquaculture industry. Examples of WS CDM program activities included:

- Providing on-farm assistance to aquaculture producers experiencing DCCO depredation to commercial fish stock. This may be provided by establishing and assisting with a non-lethal harassment program, direct removal of depredating DCCO's by shooting, or recommending cultural practices which may deter DCCO damage. Bird harassment equipment is often provided to promote non-lethal DCCO control efforts.
- Coordinating individual on-farm harassment programs to enhance CDM efficacy.
- DCCO nocturnal roost dispersal program with limited lethal removal under authority of USFWS depredation permits. Roosts are relocated in an effort to reduce local DCCO damage to aquaculture. Attempts are made to disperse DCCO roosts to non-aquaculture areas.
- Certification of on-farm non-lethal harassment programs to provide aquaculture producers authority to kill DCCO's under the AQDO.
- Technical assistance in completing applications for USFWS issued depredation permits.

WS may receive requests for assistance in resolving conflicts with cormorants in the future from entities previously discussed, or other agencies or property owners in Alabama. WS may provide technical assistance and/or direct operational assistance using any combination of approved methods discussed in this EA which are appropriate for use in these situations.

Management of Damage to Fishery Resources

The Alabama WS program works cooperatively with the ADC&NR to help protect public fishery resources from DCCO damage. Technical assistance is provided by establishing DCCO control programs at site specific lakes. Typically, these control programs emphasize dispersal of DCCO's to non-problem areas. However, with increasing DCCO populations and related damages, it has become more difficult to relocate DCCO's to suitable locations. Alabama WS has in the past worked with ADC&NR to recommend USFWS depredation permits for take of depredating DCCO's at public lakes. There is growing concern, particularly in northeast Alabama, that the ever increasing population of DCCO is having a detrimental effect on the sportfish in the rivers

and reservoirs (Scott Atkins, TVA, pers. Comm., 2004, Keith McCutcheon, ADC&NR, pers. Comm., 2004, Jay Haffner, ADC&NR, pers. Comm., 2005).

Assistance is also provided to individuals and property owner associations experiencing DCCO damage to sport fishing resources on private lakes and reservoirs. Alabama WS generally meets with these stakeholders and describes CDM strategies. USFWS depredation permits are often recommended to enhance non-lethal DCCO harassment techniques.

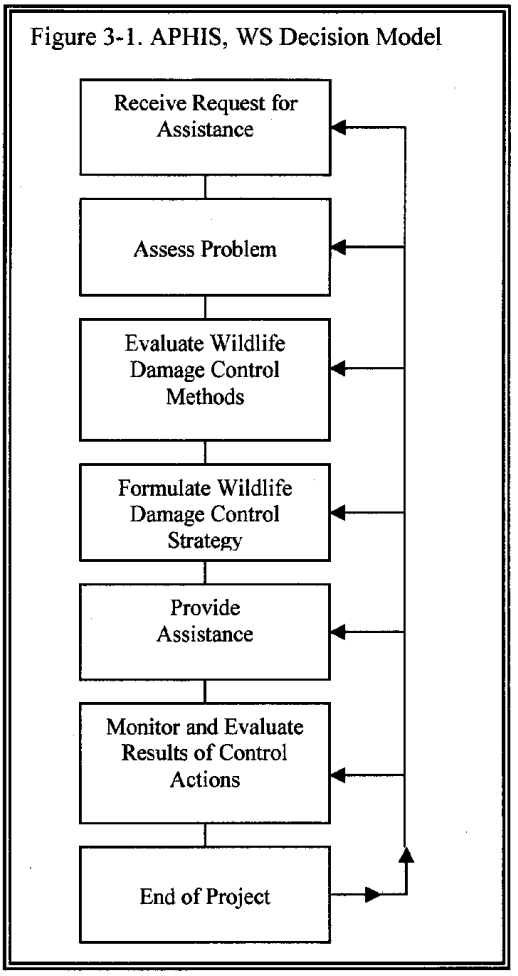
Management of Damage to Property/Natural Resources

Double-crested cormorants are known to have a negative impact on wetland habitats (Jarvie et al. 1999, Shieldcastle and Martin 1999). Habitat damage, including wetlands, by roosting cormorants in Alabama has been increasing over the last few years. Concerns range from potential impacts to nesting colonial waterbirds to potential damage to native tree species and the subsequent devaluing of property. Double-crested cormorants can displace colonial species through habitat degradation and nest site competition (USFWS 2003, Harper 1993, NYSDEC 2000). Accumulation of the cormorants' acidic feces, the proclivity of stripping of leaves for nests and the weight of both birds and nests in trees can destroy vegetation (Bedard et al. 1995, Korfanty et al. 1999, Lemmon et al. 1994, Lewis 1929, Weseloh et al.1995, Weseloh and Ewins 1994, Weseloh and Collier 1995).

Aesthetic values of living on a lake in Alabama with colonial waterbirds and large cypress trees are highly valued by many people. People have expressed concerns that DCCOs are having an adverse impact on their ability to enjoy these birds and habitat type. These property owners and homeowner associations are not willing to allow large concentrations of DCCOs to negatively impact their property and have requested WS assistance in resolving these types of conflicts. Assistance to address these types of concerns has generally been in the form of non-lethal harassment with pyrotechnics. However, the use of non-lethal harassment may not be feasible in all situations. The use of pyrotechnics can displace and disrupt nesting colonial waterbirds in some situations, and the noise attributed to pyrotechnics can cause negative impacts to other homeowners and association members. When WS assistance is provided in these situations, WS provides recommendations of how to minimize these impacts.

3.2.4 WS Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints that are depicted by the WS Decision Model described by Slate et al. (1992) (Figure 3-1). WS personnel are frequently contacted after requesters have tried or considered non-lethal methods and found them to be impractical, too costly, or inadequate for acceptably reducing damage. WS personnel assess the problem; and evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, methods deemed to be practical for the situation are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions.



3.2.5 Cormorant Damage Management Methods Available for Use by WS (*see* Appendix 4 of USFWS FEIS (USFWS 2003) for detailed description of methods)

3.2.5.1 Non-lethal Methods

Agricultural producer and property owner practices consist primarily of non-lethal preventative methods such as **cultural methods**[4] and **habitat modification.**

Animal behavior modification refers to tactics that alter the behavior of birds to reduce damages. Some, but not all, of these tactics include the following:

- Exclusion methods such as netting,
- Propane exploders (to scare birds),
- Pyrotechnics (to scare birds),
- Distress calls and sound producing devices (to scare birds),
- Visual repellents and scaring tactics (to scare birds),
- Lasers (to scare birds), and

[4]Generally involves modifications to the management of protected resources to reduce their vulnerability to wildlife

- Scarecrows.

Dispersal of DCCO day/night roosts.

Nest destruction of the target species before eggs or young are in the nest.

Lasers are a non-lethal technique recently evaluated by NWRC (Blackwell et al. 2002, Glahn et al. 2000a). The low-powered laser has proven to be effective in dispersing a variety of bird species in a number of different environments. The low-powered laser is most effective before dawn or after dusk when the red beam of the laser is clearly visible. Bright sunlight will "wash out" the laser light rendering it ineffective. Although researchers are not sure if birds see the same red spot as people, it is clear that certain bird species elicit an avoidance response in reaction to the laser. The birds view the light as a physical object or predator coming toward them and generally fly away to escape. Research, however, has shown that the effectiveness of low-powered lasers varies depending on the bird species and the context of the application.

Waterfowl, such as ducks and geese, have been successfully relocated using low-powered lasers (Blackwell et al. 2002). Long-legged wading birds, like great blue herons, have also been successfully dispersed using low-powered laser light. This discovery is especially important to aquaculture producers because it gives them another non-lethal tool for combating the heron, the double-crested cormorant, and other fish-eating birds (Glahn et al. 2000a).

The low-powered lasers that have been developed safely and effectively disperse birds without harming them or people. At higher levels, lasers can burn tissue, causing injury to people and animals. Although low-powered lasers can be effective when used in combination with other non-lethal methods, they should not be considered a cure-all. As with any non-lethal measure, once enforcement stops, problem birds can return to cause conflict again. In certain situations, non-lethal management efforts must be continuous to have the desired impact.

3.2.5.2 Lethal Methods

Egg addling/destruction is the practice of destroying the embryo in the egg prior to hatching; physically breaking eggs; or directly removing eggs from a nest and destroying them.

Egg oiling is a method for suppressing reproduction of birds by spraying a small quantity of food grade vegetable oil on eggs in nests.

Live traps/nets are various types of traps designed to capture birds alive. Cormorants captured in live traps, nets, or by hand would be humanely euthanized.

Shooting is more effective as a dispersal technique than as a way to reduce bird numbers. Shooting with rifles or shotguns is sometimes used to manage DCCO damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. The number that can be killed by shooting is generally very small in relation to the number involved in damage situations. Shooting can be helpful in some situations to supplement and reinforce other dispersal techniques. It is selective for target species and may be used in conjunction with the use of spotlights and decoys.

Cervical dislocation is an American Veterinary Medical Association (AVMA) approved euthanasia method (Beaver et al. 2001) which is sometimes used to euthanize birds which are captured by hand or in live traps/nets. The bird is stretched and the neck is hyper-extended and dorsally twisted to separate the first cervical vertebrae from the skull. The AVMA approves this technique as a humane method of euthanasia and states that cervical dislocation when properly executed is a humane technique for euthanasia of poultry and other small birds (Beaver et al. 2001). Cervical dislocation is a technique that may induce rapid unconsciousness, does not chemically contaminate tissue, and can be quickly accomplished (Beaver et al. 2001).

Carbon dioxide (CO_2) gas is an AVMA approved euthanasia method (Beaver et al. 2001) which is sometimes used to euthanize birds which are captured in live traps/nets or by hand. Live birds are placed in a container or chamber into which CO_2 gas is released. The birds quickly expire after inhaling the gas. CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

3.3.1 Lethal CDM Only By WS

Under this alternative, WS would not conduct any non-lethal control of cormorants for CDM purposes in the State, but would only conduct lethal CDM. This alternative was eliminated from further analysis because some cormorant damage problems can be resolved effectively through non-lethal means and at times lethal methods may not be available for use due to safety concerns or local ordinances prohibiting the use of some lethal methods, such as the discharge of firearms.

3.3.2 Compensation for Cormorant Damage Losses

The compensation alternative would require the establishment of a system to reimburse persons impacted by cormorant damage. This alternative was eliminated from further analysis because no Federal or State laws currently exist to authorize such action. Under such an alternative, WS would not provide any direct control or technical assistance. Aside from lack of legal authority, analysis of this alternative in the FEIS indicated that the concept has many drawbacks (USDA 1997):

- It would require larger expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation. A compensation program would likely cost several times as much as the current program.
- Compensation would most likely be below full market value. It is difficult to make timely responses to all requests to assess and confirm damage, and certain types of damage could not be conclusively verified.
- Compensation would give little incentive to resource owners to limit damage through improved cultural, husbandry, or other practices and management strategies.
- Not all resource owners would rely completely on a compensation program and unregulated lethal control would most likely continue as permitted by Federal and State law.
- Compensation would not be practical for reducing threats to human health and safety or damage to public resources.

3.3.3 Non-lethal Methods Implemented Before Lethal Methods

This alternative is similar to Alternative 1 except that WS personnel would be required to always recommend or use non-lethal methods prior to recommending or using lethal methods to reduce cormorant damage. Both technical assistance and direct damage management would be provided in the context of a modified IWDM approach. The Proposed Action recognizes non-lethal methods as an important dimension of IWDM, gives them first consideration in the formulation of each management strategy, and recommends or uses them when practical before recommending or using lethal methods. However, the important distinction between the Non-lethal Methods First Alternative and the Proposed Alternative is that the former alternative would require that all non-

lethal methods be used before any lethal methods are recommended our used.

While the humaneness of the non-lethal management methods under this alternative would be comparable to the Proposed Program Alternative, the extra harassment caused by the required use of methods that may be ineffective could be considered less humane. As local bird populations increase, the number of areas negatively affected by birds would likely increase and greater numbers of birds would be expected to congregate at sites where non-lethal management efforts were not effective. This may ultimately result in a greater number of birds being killed to reduce damage than if lethal management were immediately implemented at problem locations (Manuwal 1989). Once lethal measures were implemented, cormorant damage would be expected to drop relative to the reduction in localized populations of birds causing damage.

Since in many situations this alternative would result in greater numbers of cormorants being killed to reduce damage, at a greater cost to the requester, and result in a delay of reducing damage in comparison to the Proposed Alternative, the Non-lethal Methods Implemented Before Lethal Methods Alternative is removed from further discussion in this document.

3.3.4 Eradication and Long Term Population Suppression

An eradication alternative would direct all WS program efforts toward total long term elimination of cormorant populations on private, State, local and Federal government land wherever a cooperative program was initiated in the State. In Alabama, eradication of native bird species is not a desired population management goal of State agencies or WS. Eradication as a general strategy for managing cormorant damage will not be considered in detail because:

- All State and Federal agencies with interest in, or jurisdiction over, wildlife oppose eradication of any native wildlife species.
- Eradication is not acceptable to most people.

However, suppression of a local population of DCCO's may be considered and used as part of a cormorant damage management program as described under the Proposed Action alternative. Suppression would direct WS program efforts toward managed reduction of certain problem populations or groups. In areas where damage can be attributed to localized populations of birds, WS can decide to implement local population suppression as a result of using the WS Decision Model. It is not realistic or practical to consider large-scale population suppression as the basis of the WS program. Typically, WS activities in the State would be conducted on a very small portion of the sites or areas inhabited or frequented by cormorants.

3.4 M ITIGATION AND STANDARD OPERATING PROCEDURES FOR CORMORANT DAMAGE MANAGEMENT TECHNIQUES

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for effects that otherwise might result from that action. As appropriate, mitigation measures are incorporated in WS Standard Operating Procedures. The current WS program, nationwide and in Alabama, uses many such mitigation measures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1997) and Chapter 4 of the DCCO FEIS (USFWS 2003).

3.4.1 Standard Operating Procedures

Some key Standard Operating Procedures pertinent to the proposed action and alternatives include:

- The WS Decision Model thought process which is used to identify effective wildlife damage management strategies and their effects.

- Reasonable and prudent measures or alternatives are identified through consultation with the USFWS and are implemented to avoid effects to T&E species.
- Research is being conducted to improve CDM methods and strategies so as to increase selectivity for target species, to develop effective non-lethal control methods, and to evaluate nontarget hazards and environmental effects.
- WS uses CDM devices and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1997, Appendix P). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazards to the public is even further reduced.
- Agents acting under the authority provided to WS to conduct winter roost activities (50 CFR 21.47(c)(3)) and to protect public resources (50 CFR 21.48(c)(2)) will be informed and trained in the safe and proper use of CDM methods including applicable laws and regulations authorizing use of these methods.

3.4.2 Additional Standard Operating Procedures Specific to the Issues

The following is a summary of additional Standard Operating Procedures that are specific to the issues listed in Chapter 2 of this document.

Effects on Target Species Populations

- CDM activities are directed to resolving DCCO damage problems by taking action against individual problem birds, or local populations or groups, not by attempting to eradicate populations in the entire area or region.
- WS take is monitored by comparing numbers of birds killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse effects to the viability of native species populations (See Chapter 4).
- To avoid or minimize adverse impacts on DCCO populations, WS will abide by the terms and conditions of the PRDO, AQDO, and USFWS migratory bird permits issued to WS for the management and control of DCCO damage and conflicts, including, but not limited to, reporting on annual basis the number of nests in which eggs were oiled or destroyed and the number of DCCO's killed.

Effects on Nontarget Species Populations Including T&E Species

- WS personnel are trained and experienced to select the most appropriate method for taking problem animals and excluding nontargets.
- Observations of birds in areas that are associated with cormorant concentrations are made to determine if nontarget or T&E species would be at risk from CDM activities.
- Management actions taken in mixed-species waterbird colonies would be conducted in such a manner to minimize impacts to non-target species (i.e. visiting sites at times of the day that would avoid thermal stress to eggs/nestlings, conducting actions as early as possible in the nesting season to reduce nestling abandonment, etc.).
- WS has consulted with the USFWS regarding potential effects of control methods on T&E species, and abides by reasonable and prudent alternatives and/or reasonable and prudent measures established as a result of that consultation.
- WS will abide by the conservation measures specified in the USFWS FEIS (USFWS 2003) to avoid adverse effects on listed species.
- To avoid adverse impacts on non-target species, WS will abide by the terms and conditions of the PRDO, AQDO, and USFWS migratory bird permits issued to WS for the management and control of DCCO damage and conflicts.
- As specified in the PRDO (50 CFR 21.48(d)(10), on an annual basis, WS is required to

provide the USFWS with a statement of efforts being made to minimize incidental take of non-target species and also to report the number and species of migratory bird involved in such take, if any. The USFWS will review this information to ensure control activities taken under the PRDO will not adversely impact non-target migratory bird species.

- In certain circumstances when conducting control activities in DCCO breeding colonies, WS is required to notify the USFWS which species of other (non-target) bird species are present prior to conducting control activities (50 CFR 21.48(d)(9)). The USFWS will review this advanced notification to determine if the proposed project may threaten the long-term sustainability of non-target migratory bird species.
- Non-toxic shot will be used when using shotguns to harass or kill DCCOs.
- Winter roost activities will be conducted in such a manner to limit potential exposure to wintering waterfowl.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. The chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2. This section analyzes the environmental consequences of each alternative in comparison with the no action alternative to determine if the real or potential effects would be greater, lesser, or the same.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

Cumulative Effects: Discussed in relationship to each of the alternatives analyzed, with emphasis on potential cumulative effects from methods employed, and including summary analyses of potential cumulative impacts to target and nontarget species, including T&E species.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Effects on sites or resources protected under the National Historic Preservation Act: WS CDM actions are not undertakings that could adversely affect historic resources (See Section 1.7.2)

4.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

4.1.1 Effects on Double-crested Cormorant Populations

Alternative 1 – Integrated CDM Program, including Winter Roost Control and PRDO (Proposed Action)

The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997). Magnitude is described in USDA (1997) as *". . . a measure of the number of animals killed in relation to their abundance."* Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage.

Double-crested Cormorant Population Effects

Double-crested cormorants range throughout North America, from the Atlantic coast to the Pacific coast (USFWS 2003). During the last 20 years, the cormorant population has expanded to an estimated 372,000 nesting pairs; with the U.S. population (breeding and non-breeding birds) conservatively estimated to be greater than 1 million birds (Tyson et al. 1999). The USFWS estimates the current continental population at approximately 2 million birds (USFWS 2003). Tyson et al. (1999) found that the cormorant population increased about 2.6% annually during the early 1990's. The greatest increase was in the Interior region which was the result of a 22% annual increase in the number of cormorants in Ontario and the U.S. States bordering the Great Lakes (Tyson et al. 1999). The number of breeding pairs of cormorants in the Atlantic and Interior population is estimated at over 85,510 and 256,212 nesting pairs, respectively (Tyson et al. 1999).

DCCOs are present year-round in Alabama, with the largest concentrations occurring during the fall and winter months when the winter migrating population is present (USFWS 2003). This wintering population is primarily composed of birds from the Interior and Atlantic populations (Dolbeer 1991, Jackson and Jackson 1995). Wintering populations of DCCOs in the Delta region of Mississippi have more than doubled since the early 1990's (USFWS 2003). Similar expansion of wintering populations of DCCO's has occurred in Alabama. Roost surveys conducted by WS in Alabama indicate an increased wintering population trend from 10,014 DCCO's in 1996 to 30,619 DCCO's in 2005. Alabama Christmas Bird Count data from 1966-2004 shows an increasing trend for wintering populations of DCCO's throughout the state (National Audubon Society 2005).

The annual WS mid-winter roost survey average for the surveyed regions of Alabama from 2002 through 2005 was approximately 28,700 cormorants (Table 4-1). The numbers of DCCO's counted during this survey does not represent all of the DCCO's that migrate to or through Alabama in any winter migration period, but only represent the number present at a relatively short period of time (i.e., over the 24 hour time period in which the survey is conducted) at specific roost locations in the region. Therefore this survey information is being used as an index to monitor wintering cormorant trends in these specific regions of Alabama over time. The survey is not as a complete census of wintering DCCO's in the region or the state. The actual total number of individual DCCO's migrating to or through Alabama over the course of an entire winter migration period is probably much greater. Therefore, the total number of DCCO's killed by producers and/or by WS is probably much less of a proportion of the total wintering population than is suggested by the roost survey totals.

Table 4-1. Number of Double-crested Cormorants (DCCO) counted by conducting an annual Mid-winter roost survey throughout the primary catfish producing region of Alabama, 1996 through 2005.

Year	Number of DCCO
1996	10,014
1997	6,192
1998	12,439
1999	4,000
2000	15,310
2001*	18,430
2002*	28,340
2003*	26,930
2004*	28,900
2005*	30,619

* 2001 is the first year Lake Eufaula in east AL was surveyed; 2001-2004 survey averaged 2,225 DCCO/yr – this number jumped to 4,500 in 2005. 2002 is the first year TVA properties in northeast AL were surveyed; 2002-2005 survey averaged 4,375 DCCO/yr. 2003 is the first year Prattville in central AL was surveyed; 2003-2005 survey averaged 2.367 DCCO/yr.

Breeding populations of DCCO's in the southeastern U.S. are on the rise, with the total nesting population for this region estimated at over 13,604 nesting pairs (USFWS 2003). Little is known about historic nesting populations of DCCO's in Alabama. Cormorants have been recently reported as breeding in Alabama with colonies being documented on TVA properties in northeast Alabama. WS and TVA personnel documented 300 active nests in 2003 and 350 active nests in 2004, at five and four nest sites, respectively. The presence of 350 active nests suggests that at least 700 breeding DCCO's exist in northeast Alabama. This population estimate does not include sub-adults and nonbreeding birds. Estimates of 0.6 to 4.0 nonbreeding cormorants per breeding pair have been used for several populations (Tyson et al. 1999). Therefore, the spring/summer cormorant population in northeast Alabama can conservatively be estimated at more than 910

birds. These reports suggest the population will continue to increase, as it is a relatively recent phenomenon the birds are nesting there at all (Scott Atkins, TVA, pers. Comm., 2004). Similar expansions of nesting DCCO populations have been observed in Mississippi with Mississippi's breeding population increasing from the 34 nesting pairs identified in 1998 (Reinhold et. al 1998) to 41 and 109 nesting pairs in 2002 and 2003, respectively (unpublished data, Mississippi Ornithological Society). Incidental observations by WS field personnel also suggest an increase in the number of DCCO's throughout Arkansas during the breeding season (spring and summer months). Other than the Millwood Lake rookery, no documented breeding sites currently exist in other parts of Arkansas (A. Mueller, USFWS, pers. Comm., 2000).

Data from the Breeding Bird Survey (BBS) (1966-2003) shows that the double-crested cormorant populations throughout Alabama, the United States, USFWS Region 4 (southeast US) and the Eastern BBS region have increased at an annual rate of 51.7%, 7.6%, 2.7% and 8.3%, respectively (Sauer et al. 2004).

Double-crested cormorants are protected by the USFWS under the MBTA. Therefore, cormorants are taken in accordance with applicable state and federal laws and regulations authorizing take of migratory birds; and their nest and eggs, including the USFWS Aquaculture Depredation Order (AQDO) (50 CFR 21.47), USFWS Public Resource Depredation Order (PRDO) (50 CFR 21.48), and the USFWS and the ADC&NR permitting processes. The USFWS, as the agency with migratory bird management responsibility, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on double-crested cormorant populations would have no significant adverse impact on the quality of the human environment.

Nationwide, the USFWS predicts that the implementation of the AQDO, PRDO and issuance of migratory bird permits will affect approximately 8% of the continental DCCO population on an annual basis (USFWS 2003). Furthermore, the USFWS predicts that authorized take of cormorants and their eggs for the management of double-crested cormorant damage, including those taken in Alabama, is anticipated to have no significant impact on regional or continental double-crested cormorant populations (USFWS 2003). This includes DCCO's that may be killed in Alabama under the AQDO by aquaculture producers on aquaculture facilities and WS in winter roost sites; PRDO by WS, ADC&NR, and Indian Tribes; and those taken under USFWS issued permits. DCCO's are a long-lived bird and egg addling programs are anticipated to have minimal effects on regional or continental cormorant populations (USFWS 2003).

Aquaculture Depredation Order (50 CFR 21.47)

Aquaculture Producers. From the 13 states authorized to use the AQDO (including Alabama), the USFWS (2003) estimated that an average of 35,900 cormorants (cumulative total for all 13 states) were killed each year from 1998-2000. Using the methodology for estimating take under the aquaculture depredation provided by the USFWS (Appendix 5, USFWS (2003)), WS estimates that over 8,170 DCCO's (43 aquaculture producers reportedly taking DCCO's (Form 37) x 190 DCCO's) where killed by Alabama aquaculture producers in 2003 to protect commercial aquaculture throughout the state. The USFWS (2003) predicts that this level of lethal take by commercial aquaculture producers would have no significant impact on regional or continental DCCO populations.

Winter Roost Sites. According to the USFWS (2003), Alabama WS winter roost control activities to protect commercial aquaculture could result in a lethal take equal to 25% of the number of DCCOs killed under the AQDO by aquaculture producers on an annual basis. For example, using the total estimated take of 8,170 cormorants by aquaculture producers in 2003, WS lethal take in winter roost sites in 2003 would be estimated at

approximately 2,043 birds. The USFWS (2003) predicts that this level of lethal take by WS in winter roost sites would have no significant impact on regional or continental DCCO populations.

Public Resource Depredation Order (50 CFR 21.48)

According to the USFWS (2003), under the PRDO, the implementation of a state-wide program to reduce cormorant impacts to public resources on land and freshwaters could result in the lethal take of up to an additional 4,140 cormorants on an annual basis in Alabama. WS predicts that the Alabama WS program would lethally take no more than approximately 75% (3,105) of this statewide total on an annual basis. The USFWS predicts that the implementation of the PRDO in Alabama will have no significant impact to regional or continental DCCO populations (USFWS 2003).

USFWS Migratory Bird Permits

In 2004, the USFWS authorized 5,000 DCCO's to be taken under migratory bird permits in Alabama. In 2004, under USFWS issued permits, Alabama WS personnel killed 864 DCCO which were depredating commercial aquaculture or damaging private property, but did not destroy any cormorant nests at any project sites in the State (Unpublished WS data). From FY 1999 through FY 2004, Alabama WS personnel did not take any cormorants or destroy any cormorant nests at all project sites in the State in all damage situations (MIS database). However, based on a predicted increase in future requests for services, WS anticipates that no more than 5,000 DCCO's will be taken annually by WS in Alabama under USFWS issued migratory bird permits. The USFWS predicts that the issuance of migratory bird permits in Alabama will have no significant impact to regional or continental DCCO populations (USFWS 2003).

Based upon the above information, Alabama WS potential impacts to populations of double-created cormorants is expected to be insignificant to the overall viability and reproductive success of this bird species population on a local, state, regional, and nationwide scale.

Alternative 2 - Non-lethal CDM Only By WS

Under this alternative, WS would not kill any DCCOs or destroy eggs because no lethal methods would be used. The ADC&NR, USFWS, Indian Tribes, and others could still implement lethal control actions that are available to them. Although WS lethal take of cormorants would not occur, it is likely that without WS conducting some level of lethal CDM; private or state CDM efforts could increase, leading to potentially similar or even greater effects on DCCO populations than those of the no action alternative. For the same reasons shown in the population effects analysis under the proposed action it is unlikely that cormorant populations would be adversely impacted by implementation of this alternative.

Alternative 3 - Technical Assistance Only

Under this alternative, WS would have no impact on cormorant populations in the State because the program would not conduct any operational CDM activities but would be limited to providing advice only. WS would not take part in winter roost control activities or implementation of the PRDO. The ADC&NR, USFWS, Indian Tribes, and others could still implement lethal control actions that are available to them. Private or state efforts to reduce or prevent cormorant damage and conflicts could increase which could result in similar or even greater effects on those populations than no action alternative. For the same reasons shown in the population effects analysis under the proposed action it is unlikely that cormorant populations would be adversely impacted by implementation of this alternative. Effects on cormorant populations under this

alternative would probably be about the same as those under Alternative 2.

Alternative 4 - No Federal WS CDM

Under this alternative, WS would have no impact on cormorant populations in the State. The ADC&NR, USFWS, Indian Tribes, and others could still implement lethal control actions that are available to them. Private efforts to reduce or prevent damage and conflicts could increase which could result in effects on cormorant populations to an unknown degree. Effects on cormorants under this alternative could be the same, less, or more than those of the no action alternative depending on the level of effort expended by these individuals. For the same reasons shown in the population effects analysis under the proposed action it is unlikely that cormorant populations would be adversely impacted by implementation of this alternative.

Alternative 5 - Integrated CDM Program, excluding Winter Roost Control and PRDO (No Action)

Impacts of this alternative would be similar to Alternative 1, except WS would not take part in winter roost control activities or implement the PRDO. The ADC&NR, USFWS, Indian Tribes, and others could still implement lethal control actions that are available to them. The ADC&NR and Indian Tribes would be able to implement the PRDO; aquaculture producer would continue to lethally take DCCO's under the AQDO; and the USFWS would continue to issue migratory bird permits to take DCCO's and their eggs.

Aquaculture Depredation Order (50 CFR 21.47)

Aquaculture Producers. From the 13 states authorized to use the AQDO (including Alabama), the USFWS (2003) estimated that an average of 35,900 cormorants (cumulative total for all 13 states) were killed each year from 1998-2000. Using the methodology for estimating take under the aquaculture depredation provided by the USFWS (Appendix 5, USFWS (2003)), WS estimates that over 8,170 DCCO's (43 aquaculture producers reportedly taking DCCO's (Form 37) x 190 DCCO's) where killed by Alabama aquaculture producers in 2003 to protect commercial aquaculture throughout the state. The USFWS (2003) predicts that this level of lethal take by commercial aquaculture producers would have no significant impact on regional or continental DCCO populations.

Public Resource Depredation Order (50 CFR 21.48)

According to the USFWS (2003), under the PRDO, the implementation of a state-wide program to reduce cormorant impacts to public resources could result in the lethal take of up to an additional 4,140 cormorants on an annual basis in Alabama. The USFWS predicts that the implementation of the PRDO in Alabama will have no significant impact to regional or continental DCCO populations (USFWS 2003).

USFWS Migratory Bird Permits

In 2004, the USFWS authorized 5,000 DCCO's to be taken under migratory bird permits in Alabama. In 2004, under USFWS issued permits, Alabama WS personnel killed 864 DCCO which were depredating commercial aquaculture or damaging private property, but did not destroy any cormorant nests at any project sites in the State (Unpublished WS data). From FY 1999 through FY 2004, Alabama WS personnel did not take any cormorants or destroy any cormorant nests at all project sites in the State in all damage situations (MIS database). However, based on a predicted increase in future requests for services, WS anticipates that no more than 5,000 DCCO's will be taken annually by WS

in Alabama under USFWS issued migratory bird permits. The USFWS predicts that the issuance of migratory bird permits in Alabama will have no significant impact to regional or continental DCCO populations (USFWS 2003).

For the same reasons shown in the population effects analysis under the proposed action it is unlikely that cormorant populations would be adversely impacted by implementation of this alternative.

4.1.2 Effects on Other Wildlife Species, Including T&E Species

Alternative 1 - Integrated CDM Program, including Winter Roost Control and PRDO (Proposed Action)

Adverse Effects on Nontarget (non-T&E) Species. Impacts would be similar to the no action alternative.

Beneficial Effects on Nontarget Species. Programs to control cormorant damage can benefit those wildlife species that are impacted by their predation or competition for habitat. Besides competing for nesting space, the acidic droppings of cormorants destroy vegetation, making the area unsuitable for rapid nesting colony restoration. This alternative has the greatest possibility of successfully reducing cormorant damage and conflicts to wildlife species since all CDM methods could possibly be implemented or recommended by WS and WS would be able to implement the PRDO.

T&E Species Effects. Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. Mitigation measures to avoid T&E effects are described in Chapter 3.

Federally Listed Species. WS has obtained and reviewed the list of federally listed T&E species for Alabama (see Appendix B for species list) and has determined that the proposed program will have no effect on any federally listed T&E species or critical habitat. The USFWS has completed an intra-Service biological evaluation and informal Section 7 consultation on the management of double-crested cormorants in the U.S. and has determined that only the bald eagle, interior least tern (not listed in AL), wood stork, and piping plover could be adversely affected by CDM actions (USFWS 2003). In accordance with this consultation the USFWS states that the following conservation measures would avoid adverse effects on the bald eagle, wood stork, interior least tern and piping plover:

Under AQDO

(i) All CDM control activities are allowed if the activities occur more than 1,500 feet from active wood stork nesting colonies, more than 1,000 feet from active wood stork roost sites, and more than 750 feet from feeding wood storks, and if they occur more than 750 feet from an active bald eagle nest.

Under PRDO

(i) Discharge/use of firearms to kill or harass double-crested cormorants or use of other harassment methods are allowed if the control activities occur more than 1000 feet from active piping plover or interior least tern nests or colonies; occur more than 1500 feet from active wood stork nesting colonies, more than 1000 feet from active wood stork roost sites, and more than 750 feet from feeding wood storks; or occur more than 750 feet from active bald eagle nests;

(ii) Other control activities such as egg oiling, cervical dislocation, CO_2 asphyxiation, egg destruction, or nest destruction are allowed if these activities occur more than 500 feet

from active piping plover or interior least tern nests or colonies; occur more than 1500 feet from active wood stork nesting colonies, more than 1000 feet from active wood stork roost sites, and more than 750 feet from feeding wood storks; or occur more than 750 feet from active bald eagle nests;

(iii) To ensure adequate protection of piping plovers, any Agency or their agents who plan to implement control activities that may affect areas designated as piping plover critical habitat in the Great Lakes Region are to make contact with the appropriate Regional Migratory Bird Permit Office prior to implementing control activities.

WS will abide by these conservation measures to avoid adverse impacts to the bald eagle, wood stork, and piping plover in Alabama.

State Listed Species. WS has obtained and reviewed the State list of Protected Nongame Species for Alabama (see Appendix C for species list) and has determined that CDM will not adversely affect any state listed species in Alabama [** Note the State of Alabama does not maintain a list of threatened, endangered, or species of special concern status. Rather, certain "nongame" species are given special protection against "take"; "take" not specifically defined.]. WS will periodically consult with the ADC&NR to ensure that no actions taken under this plan will adversely affect Alabama listed species. In some situations, WS actions could benefit listed species by reducing cormorant conflicts with those species.

Alternative 2 - Non-lethal CDM Only By WS

Adverse Effects on Nontarget Species
Under this alternative, WS take of nontarget animals would probably be less than that of the no action alternative because no lethal control actions would be taken by WS. However, nontarget take would not differ substantially from the current program because the current program has no recorded take of non-target animals. Non-target migratory bird species and other non-target wildlife species are usually not affected by WS non-lethal CDM methods, except for the occasional scaring from harassment devices. In these cases, migratory birds and other affected non-target wildlife may temporarily leave the immediate vicinity of scaring, but would most likely return after conclusion of the action.

People whose cormorant damage problems were not effectively resolved by non-lethal control methods would likely resort to other means of lethal control. This could result in less experienced persons implementing control methods and could lead to greater take of nontarget wildlife. For example, shooting by persons not proficient at bird identification could lead to killing of nontarget birds.

Beneficial Effects on Nontarget Species
This alternative would reduce negative impacts caused by cormorants to wildlife species and their habitats, including T&E species, if non-lethal methods were effective in reducing such damage to acceptable levels. If non-lethal methods were ineffective at reducing damage to acceptable levels, WS would not be available to conduct or provide advice on any other types of control methods. In these situations it would be expected that cormorant damage to wildlife species and their habitats would likely remain the same or possibly increase dependent upon actions taken by the affected resource or landowner.

Alternative 3 - Technical Assistance Only

Adverse Effects on Nontarget Species
Alternative 3 would not allow any WS direct operational CDM in Alabama. There would be no impact on nontarget or T&E species by WS activities from this alternative. Technical assistance

or self-help information would be provided at the request of producers and others. Although technical support might lead to more selective use of lethal control methods by private parties than that which might occur under Alternative 2, private efforts to reduce or prevent depredations could still result in less experienced persons implementing control methods leading to greater take of nontarget wildlife.

Beneficial Effects on Nontarget Species
The ability to reduce negative impacts caused by cormorants to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing control actions. It would be expected that this alternative would have a greater chance of reducing damage than Alternative 4 since WS would be available to provide information and advice.

Alternative 4 - No Federal WS CDM

Adverse Effects on Nontarget Species
Alternative 4 would not allow any WS CDM in the State. There would be no impact on nontarget or T&E species by WS CDM activities from this alternative. However, private efforts to reduce or prevent depredations could increase which could result in less experienced persons implementing control methods and could lead to greater take of nontarget wildlife.

Beneficial Effects on Nontarget Species
The ability to reduce negative impacts caused by cormorants to wildlife species and their habitats, including T&E species, would be variable based upon the skills and abilities of the person implementing control actions.

Alternative 5 - Integrated CDM Program, excluding Winter Roost Control and PRDO (No Action)

Adverse Effects on Nontarget (non-T&E) Species. Direct impacts on nontarget species occur when WS program personnel inadvertently kill, injure, or harass animals that are not target species. In general, these impacts result from the use of methods that are not completely selective for target species. Non-target migratory bird species and other non-target wildlife species are usually not affected by WS's CDM methods, except for the occasional scaring from harassment devices and when WS conducts breeding DCCO management in mixed-species waterbird colonies. In these cases, migratory birds and other affected non-target wildlife may temporarily leave the immediate vicinity of scaring, but would most likely return after conclusion of the action. Mitigation measures to reduce potential impacts to nontarget species are listed in Chapter 3.

WS take of non-target species during CDM activities has been extremely low and should not increase substantially above current levels of take. No non-target birds or mammals have been killed during CDM operations in Alabama from FY 1999-2004 (MIS database).

While every precaution is taken to safeguard against taking nontarget birds, at times changes in local flight patterns and other unanticipated events can result in the incidental take of unintended species. These occurrences are rare and should not affect the overall populations of any species under the proposed program.

Beneficial Effects on Nontarget Species. Programs to control cormorant damage can benefit those wildlife species that are impacted by their predation or competition for habitat. This alternative would reduce negative impacts caused by cormorants to wildlife species and their habitats, including T&E species, if they could be resolved through other means besides WS implementation of the PRDO. If not damage and conflicts would likely continue to occur or

possibly increase.

T&E Species Effects. Impacts would be similar to the proposed action.

4.1.3 Effects on Human Health and Safety

4.1.3.1 Effects on Human Health and Safety from CDM Methods

Alternative 1 - Integrated CDM Program, including Winter Roost Control and PRDO (Proposed Action)

CDM methods that might raise safety concerns include shooting with firearms and harassment with pyrotechnics. Firearms are only used by WS personnel and their designated agents who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The Alabama WS program has had no accidents involving the use of firearms or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse effects on human safety from WS's use of these methods are expected.

Agents acting under the authority provided to WS to conduct winter roost activities (50 CFR 21.47(c)(3)) and to protect public resources (50 CFR 21.48(c)(2)) will be informed and trained in the safe and proper use of CDM methods including the use of firearms.

Alternative 2 - Non-lethal CDM Only By WS

Under this alternative, CDM methods that might raise safety concerns include shooting with firearms when used as a harassment technique and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The Alabama WS program has had no accidents involving the use of firearms or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse effects on human safety from WS's use of these methods are expected. Impacts would be similar to the no action alternative.

Alternative 3 - Technical Assistance Only

Under this alternative, WS would not engage in direct operational use of any CDM methods. Risks to human safety from WS's use of firearms and pyrotechnics would hypothetically be lower than the no action alternative, but not significantly because Alabama WS's current program has an excellent safety record in which no accidents involving the use of these devices have occurred that have resulted in a member of the public being harmed.

Resource owners and other non-WS employees would be able to use pyrotechnics or firearms in CDM programs and this activity would likely occur to a greater extent in the absence of WS's assistance. Hazards to humans and property could be greater under this alternative if personnel conducting CDM activities are poorly or improperly trained. Since WS would be available to provide advice and information on the safe and proper use of these methods adverse impacts should be less than Alternative 4.

Alternative 4 - No Federal WS CDM

Alternative 4 would not allow any WS CDM in the State. Concerns about human health risks from WS's use of CDM methods would be alleviated because no such use would occur. The use of firearms or pyrotechnics by WS would not occur in CDM activities in the State.

However, private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and potentially leading to greater risk to human health and safety than the no action alternative. Resource owners and other non-WS employees would be able to use pyrotechnics or firearms in CDM programs and this activity would likely occur to a greater extent in the absence of WS's assistance. Hazards to humans and property could be greater under this alternative if personnel conducting CDM activities are poorly or improperly trained.

Alternative 5 - Integrated CDM Program, excluding Winter Roost Control and PRDO (No Action)

CDM methods that might raise safety concerns include shooting with firearms and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The Alabama WS program has had no accidents involving the use of firearms or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse effects on human safety from WS's use of these methods are expected.

4.1.3.2 Effects on Human Health and Safety from Not Conducting CDM

Alternative 1 - Integrated CDM Program, including Winter Roost Control and PRDO (Proposed Action)

Impacts would be similar to the no action alternative.

Alternative 2 - Non-lethal CDM Only By WS

Under this alternative, WS would be restricted to implementing and recommending only non-lethal CDM methods in providing assistance with cormorant damage problems and conflicts. The success or failure of the use of non-lethal methods can be quite variable. In some situations the implementation of non-lethal controls such as harassment could actually increase the risk of human health problems at other sites by causing the birds to move to other sites not previously affected. Some requesting entities would reject WS assistance for this reason and would likely seek to achieve cormorant control by other means. However, if WS is providing direct operational assistance in relocating cormorants, coordination with local authorities may be conducted to assure they do not re-establish in other undesirable locations.

Alternative 3 - Technical Assistance Only

Potential impacts would be variable. With WS technical assistance but no direct management, entities requesting CDM assistance for human health concerns would either take no action, which means the risk of human health problems would likely continue or increase in each situation as bird numbers are maintained or increased, or implement WS

recommendations for non-lethal and lethal control methods. Individuals or entities that implement management actions may or may not have the experience necessary to efficiently and effectively conduct an effective CDM program.

In some situations the implementation of non-lethal controls such as harassment could actually increase the risk of human health problems at other sites by causing the birds to move to other sites not previously affected. This potential risk would be less likely under this alternative than Alternative 4 when people requesting assistance receive and accept WS technical assistance recommendations.

Alternative 4 - No Federal WS CDM

Potential impacts would be variable. With no WS assistance, resource owners (land managers) would be responsible for developing and implementing their own CDM program. Efforts by these individuals to reduce or prevent conflicts could result in less experienced persons implementing control methods, therefore leading to a greater potential of not reducing cormorant hazards, than under the proposed action.

In some situations the implementation of non-lethal controls such as harassment could actually increase the risk of human health problems at other sites by causing the birds to move to other sites not previously affected. Under this alternative, human health problems could increase if private individuals were unable to find and implement effective means of controlling cormorants that cause damage problems.

Alternative 5 - Integrated CDM Program, excluding Winter Roost Control and PRDO (No Action)

People are concerned with potential injury, illness, and loss of human life resulting from damage and conflicts associated with cormorants. An Integrated CDM strategy, a combination of lethal and non-lethal means, has the greatest potential of successfully reducing this risk. All CDM methods could possibly be implemented and recommended by WS.

An IWDM approach reduces damage or threats to public health or safety for people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. As discussed in Chapter 1, cormorants are a threat to aviation safety and can also carry or transmit diseases to humans. In most cases, it is difficult to conclusively prove that cormorants were responsible for transmission of individual human cases or outbreaks of bird-borne diseases. Nonetheless, certain requesters of CDM service may consider this risk to be unacceptable and may request such service primarily for that reason. In such cases, CDM, either by lethal or non-lethal means, would, if successful, reduce the risk of bird-borne disease transmission at the site for which CDM is requested.

In some situations the implementation of non-lethal controls such as harassment could actually increase the risk of human health problems at other sites by causing the birds to move to other sites not previously affected. In such cases, lethal removal of the birds may actually be the best alternative from the standpoint of overall human health concerns in the local area. If WS is providing direct operational assistance in relocating cormorants, coordination with local authorities may be conducted to assure they do not reestablish in other undesirable locations.

4.1.4 Effects on Aesthetic Values

Alternative 1 - Integrated CDM Program, including Winter Roost Control and PRDO

(Proposed Action)

Impacts would be similar to the no action alternative, except in those instances where the implementation of the PRDO improves the aesthetic values of those persons adversely affected by cormorant damage and conflicts to wildlife species and their habitats. In these situations this type of aesthetic "damage" would be less than the no action alternative.

Alternative 2 - Non-lethal CDM Only By WS

Under this alternative, WS would not conduct any lethal CDM but would still use non-lethal CDM methods, such as harassment of birds that were causing damage. Some people who oppose lethal control of wildlife by government but are tolerant of government involvement in non-lethal wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds would not be affected by the death of individual birds under this alternative, but might oppose dispersal or translocation of certain birds. Although WS would not perform any lethal activities under this alternative, other private/public entities would likely conduct lethal CDM activities in WS absence. The effects would then be similar to the no action alternative.

This alternative would reduce the negative impacts caused by cormorants to aesthetic values if non-lethal methods were effective in reducing such damage to acceptable levels. If non-lethal methods were ineffective WS would not be available to conduct or provide advice on any other types of control methods. In these situations it would be expected that negative impacts caused by cormorants would likely remain the same or possibly increase dependent upon actions taken by the affected resource or land owner.

Alternative 3 - Technical Assistance Only

Under this alternative, WS would not conduct any direct operational CDM but would still provide technical assistance or self-help advice to persons requesting assistance with cormorant damage. WS would not take part in winter roost control activities or implementation of the PRDO. Some people who oppose direct operational assistance in wildlife damage management by the government but favor government technical assistance would favor this alternative. Persons who have developed affectionate bonds with individual wild birds would not be affected by WS's activities under this alternative because the individual birds would not be killed by WS. However, other private entities would likely conduct lethal CDM activities in WS absence. The effects would then be similar to the no action alternative.

Under this alternative, the lack of operational assistance in reducing cormorant problems could result in an increase in adverse affects on aesthetic values. However, potential adverse affects would likely be less than as those under Alternative 4, since WS would be providing technical assistance.

Alternative 4 - No Federal WS CDM

Under this alternative, WS would not conduct any CDM in Alabama. Some people who oppose any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual cormorants would not be affected by WS's activities under this alternative. However, other private/public entities would likely conduct CDM activities similar to those no longer conducted by WS. The effects would then be similar to the no action alternative.

Under this alternative, the lack of any operational or technical assistance by WS in reducing cormorant problems would mean aesthetic values of some individuals would continue to be

adversely affected if the property owner/manager were not able to achieve CDM some other way. In many cases, this type of aesthetic "damage" would worsen because property owners/managers would not be able to resolve their problems.

Alternative 5 - Integrated CDM Program, excluding Winter Roost Control and PRDO (No Action)

Some people who routinely view individual birds or flocks of cormorants would likely be disturbed by removal of such birds under the current program. WS is aware of such concerns and takes this into consideration when planning CDM activities.

Some people have been opposed to the killing of any birds during CDM activities. Under the current program, some lethal control of cormorants would continue and these persons would continue to be opposed. However, many persons who voice their opposition have no direct connection or opportunity to view or enjoy the particular birds that would be killed by WS's lethal control activities. Lethal control actions would generally be restricted to local sites and to small, unsubstantial percentages of overall populations. Therefore, the species subjected to limited lethal control actions would remain common and abundant, therefore continuing to remain available for viewing by persons with that interest. Lethal removal of cormorants from airports should not affect the public's enjoyment of the aesthetics of the environment since airport properties are closed to public access. The abilities to view and interact with cormorants at these sites are usually either restricted to viewing from a location outside boundary fences or forbidden.

In some instances, large roosting or nesting populations of cormorants can destroy habitat and displace other nesting birds, reducing the aesthetic value for some people. This alternative would reduce negative impacts caused by cormorants to wildlife species and their habitats, if they could be resolved through other means besides WS implementation of the PRDO. If not damage and conflicts would likely continue to occur or possibly increase.

4.1.5 Humaneness and Animal Welfare Concerns of the Methods Used

Alternative 1 - Integrated CDM Program, including Winter Roost Control and PRDO (Proposed Action)

Impacts would be similar to the no action alternative.

Alternative 2 - Non-lethal CDM Only By WS

Under this alternative, lethal methods viewed as inhumane by some persons would not be used by WS. Shooting; and live capture and euthanization by decapitation, cervical dislocation or CO_2 gas could be used by non-WS entities and, similar to the no action alternative, would be viewed by some persons as inhumane.

Alternative 3 - Technical Assistance Only

Under this alternative, WS would not conduct any lethal or non-lethal CDM, but would provide self-help advice only. Thus, lethal methods viewed as inhumane by some persons would not be used by WS. Similar to Alternative 2, shooting; and live capture and euthanization by decapitation, cervical dislocation or CO_2 gas would be available for use by non-WS entities and would be viewed by some persons as inhumane.

Alternative 4 - No Federal WS CDM

Under this alternative, methods viewed as inhumane by some persons would not be used by WS. Similar to Alternative 2 and 3, shooting; and live trapping/capture and euthanasia by decapitation, cervical dislocation or CO_2 gas could be used by non-WS entities and would be viewed by some persons as inhumane.

Alternative 5 - Integrated CDM Program, excluding Winter Roost Control and PRDO (No Action)

Under this alternative, methods viewed by some persons as inhumane would be used in CDM by WS. Shooting, when performed by experienced professionals, usually results in a quick death for target birds. Occasionally, however, some birds are initially wounded and must be shot a second time or must be caught by hand and then dispatched or euthanized. Some persons would view shooting as inhumane.

Occasionally, cormorants captured alive would be euthanized. The most common method of euthanasia would be by decapitation, cervical dislocation or CO_2 gas. These methods are described and approved by AVMA as humane euthanasia methods (Beaver et al. 2001). Most people would view AVMA approved euthanasia methods as humane.

4.2 CUMULATIVE IMPACTS

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

Under Alternatives 1, 2, 3 and 5, WS would address damage associated with cormorants in a number of situations throughout the State. The WS CDM program would be the primary federal program with CDM responsibilities; however, some state and local government agencies may conduct CDM activities in Alabama as well. Through ongoing coordination with these agencies, WS is aware of such CDM activities and may provide technical assistance in such efforts. WS does not normally conduct direct damage management activities concurrently with such agencies in the same area, but may conduct CDM activities at adjacent sites within the same time frame. In addition, private individuals may conduct CDM activities in the same area as WS. The potential cumulative impacts analyzed below could occur either as a result of WS CDM program activities over time, or as a result of the aggregate effects of those activities combined with the activities of other agencies and individuals.

Cumulative Impacts on Wildlife Populations

CDM methods used or recommended by the WS program in Alabama will likely have no cumulative adverse effects on double-crested cormorants and non-target wildlife populations. WS limited lethal take of DCCOs is anticipated to have minimal impacts on cormorant populations in Alabama, the region, and the U.S. Population trend data and information provided in the FWS FEIS (USFWS 2003) indicate that cormorant populations have increased for Alabama, the region and the U.S. over the past 20 years. When control actions are implemented by WS the potential lethal take of non-target wildlife species is expected to be minimal to non-existent.

Cumulative Impact Potential from CDM Methods

CDM methods used or recommended by WS may include exclusion through use of various barriers, habitat modification of structures or vegetation, live trapping and euthanasia of birds, harassment of birds or bird flocks, nest and egg destruction, and shooting.

Because shooting may be considered as a component of the program, the deposition of lead shot in the environment is a factor considered in this EA.

> ***Lead Shot.*** Threats of lead toxicosis to waterfowl from the deposition of lead shot in waters where such species fed were observed more than one hundred years ago (Sanderson and Belrose 1986). As a result of discoveries made regarding impacts to several species of ducks and geese, federal restrictions were placed on the use of lead shot for waterfowl hunting in 1991. "Beginning September 1, 1991, the contiguous 48 United States, and the States of Alaska and Hawaii, the Territories of Puerto Rico and the Virgin Islands, and the territorial waters of the United States, are designated for the purpose of Sec. 20.21 (j) as nontoxic shot zones for hunting waterfowl, coots, and certain other species. 'Certain other species' refers to those species, other than waterfowl or coots, affected by reason of being included in aggregate bags and concurrent seasons."
>
> All WS CDM shooting activities conform to federal, state and local laws. Consequently, no deposition of lead in nontoxic shot zones is likely to occur as a result of WS CDM actions in Alabama. Therefore, cumulative impacts are not likely to occur.

SUMMARY

No significant cumulative environmental impacts are expected from any of the 5 alternatives. Under the Proposed Action, the lethal removal of cormorants by WS would not have a significant impact on overall cormorant populations in Alabama, but some local reductions may occur. No risk to public safety is expected when WS' services are provided and accepted by requesting individuals in Alternatives 1, 2, 3 and 5 since only trained and experienced wildlife biologists/specialists and designated agents would conduct and recommend CDM activities. There is a slight increased risk to public safety when persons who reject WS assistance and recommendations in Alternatives 1, 2, 3 and 5 and conduct their own CDM activities, and when no WS assistance is provided in Alternative 4. In all 5 Alternatives, however, it would not be to the point that the impacts would be significant. Although some persons will likely be opposed to WS' participation in CDM activities on public and private lands within the state of Alabama, the analysis in this EA indicates that WS Integrated CDM program will not result in significant cumulative adverse impacts on the quality of the human environment. Table 4-2 summarizes the expected impact of each of the alternatives on each of the issues.

Table 4-2. Summary of impacts of each of the alternatives on each of the issues related to CDM by WS in Alabama.

Issues	*Alternative 1* *Integrated CDM Program* *(Proposed Action)*	*Alternative 2* *Non-lethal CDM Only by WS*	*Alternative 3* *Technical Assistance Only*	*Alternative 4* *No Federal WS CDM Program*	*Alternative 5* *Integrated CDM, Excluding Winter Roost Control and PRDO* *(No Action)*
Effects on DCCO Populations	Low effect - reductions in local cormorant numbers; would not significantly affect state, regional and continental populations	Low effect - reductions in local cormorant numbers by non-WS personnel likely; would not significantly affect state, regional and continental populations.	No effect by WS. Low effect - reductions in local cormorant numbers by non-WS personnel likely; would not significantly affect state, regional and continental populations.	No effect by WS. Low effect - reductions in local cormorant numbers by non-WS personnel likely; would not significantly affect state, regional and continental populations	Low effect - reductions in local cormorant numbers; would not significantly affect state, regional and continental populations
Effects on Other Wildlife Species, Including T&E Species	Low effect - methods used by WS would be highly selective with very little risk to non-target species.	Low effect - methods used by WS would be highly selective with very little risk to non-target species.	No effect by WS. Impacts by non-WS personnel would be variable.	No effect by WS. Impacts by non-WS personnel would be variable.	Low effect - methods used by WS would be highly selective with very little risk to non-target species.
Effects on Human Health and Safety	This alternative will reduce this risk. Low risk from methods used by WS.	Impacts could be greater under this alternative. Low risk from methods used by WS.	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater potential of not reducing cormorant damage.	Efforts by non-WS personnel to reduce or prevent conflicts could result in less experienced persons implementing control methods, leading to a greater potential of not reducing cormorant damage.	This alternative will reduce this risk. Low risk from methods used by WS.
Aesthetic Enjoyment of Cormorants	Low to moderate effect at local levels; Some local populations may be reduced; WS cormorant damage management activities do not adversely affect overall state, regional and continental cormorant populations.	Low to moderate effect. Local bird numbers in damage situations would remain high or possibly increase when non-lethal methods are ineffective unless non-WS personnel successfully implement lethal methods; no adverse affect on overall state, regional and continental cormorant populations.	Low to moderate effect. Local bird numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement lethal methods; no adverse affect on overall state, regional and continental cormorant populations.	Low to moderate effect. Local bird numbers in damage situations would remain high or possibly increase unless non-WS personnel successfully implement lethal methods; no adverse affect on overall state, regional and continental cormorant populations.	Low to moderate effect at local levels; Some local populations may be reduced; WS cormorant damage management activities do not adversely affect overall state, regional and continental cormorant populations.

Issues	*Alternative 1* *Integrated CDM Program* *(Proposed Action)*	*Alternative 2* *Non-lethal CDM Only by WS*	*Alternative 3* *Technical Assistance Only*	*Alternative 4* *No Federal WS CDM Program*	*Alternative 5* *Integrated CDM, Excluding Winter Roost Control and PRDO* *(No Action)*
Aesthetic Damage Caused by Cormorants	Low effect - cormorant damage problems most likely to be resolved without creating or moving problems elsewhere.	Moderate to High effect - cormorants may move to other sites which can create aesthetic damage problems at new sites. Less likely than Alt. 3 and 4.	Moderate to High effect - cormorants may move to other sites which can create aesthetic damage problems at new sites.	High effect - cormorant problems less likely to be resolved without WS involvement. Birds may move to other sites which can create aesthetic damage problems at new sites	Low effect - cormorant damage problems most likely to be resolved without creating or moving problems elsewhere.
Humaneness and Animal Welfare Concerns of Methods Used	Low to moderate effect - methods viewed by some people as inhumane would be used by WS.	Lower effect than Alt. 2 since only non-lethal methods would be used by WS	No effect by WS. Impacts by non-WS personnel would be variable.	No effect by WS. Impacts by non-WS personnel would be variable.	Low to moderate effect - methods viewed by some people as inhumane would be used by WS.

CHAPTER 5: LIST OF PREPARERS, CONSULTANTS, AND REVIEWERS

5.0 LIST OF PREPARERS AND PERSONS CONSULTED

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APPENDIX A

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APPENDIX B

SPECIES THAT ARE FEDERALLY LISTED AS THREATENED OR ENDANGERED IN THE STATE OF ALABAMA

SPECIES THAT ARE FEDERALLY LISTED AS THREATENED OR ENDANGERED IN THE STATE OF ALABAMA

(T = Threatened, E = Endangered, S/A = Similarity of Appearance Species, XE = Essential Experimental Population, XN = Nonessential Experimental Population)

Alabama -- 115 listings

Animals – 97

Status	**Listing**
E	Acornshell, southern (*Epioblasma othcaloogensis*)
T(S/A)	Alligator, American (*Alligator mississippiensis*)
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
XN	Bean, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Villosa trabalis*)
XN	Blossom, tubercled (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma torulosa torulosa*)
E	Blossom, turgid (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma turgidula*)
XN	Blossom, turgid (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma turgidula*)
E	Blossom, yellow (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma florentina florentina*)
XN	Blossom, yellow (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma florentina florentina*)
E	Campeloma, slender (*Campeloma decampi*)
E	Catspaw (=purple cat's paw pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma obliquata obliquata*)
XN	Catspaw (=purple cat's paw pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma obliquata obliquata*)
E	Cavefish, Alabama (*Speoplatyrhinus poulsoni*)
T	Chub, spotfin Entire (*Cyprinella monacha*)
XN	Clubshell AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Pleurobema clava*)
E	Clubshell, ovate (*Pleurobema perovatum*)
E	Clubshell, southern (*Pleurobema decisum*)
E	Combshell, Cumberlandian Entire Range; Except where listed as Experimental Populations (*Epioblasma brevidens*)
XN	Combshell, Cumberlandian AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma brevidens*)
E	Combshell, southern (*Epioblasma penita*)
E	Combshell, upland (*Epioblasma metastriata*)
E	Darter, boulder (*Etheostoma wapiti*)
T	Darter, goldline (*Percina aurolineata*)
T	Darter, slackwater (*Etheostoma boschungi*)
T	Darter, snail (*Percina tanasi*)
E	Darter, vermilion (*Etheostoma chermocki*)
E	Darter, watercress (*Etheostoma nuchale*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Elimia, lacy (snail) (*Elimia crenatella*)
E	Fanshell (*Cyprogenia stegaria*)
T	Heelsplitter, Alabama (=inflated) (*Potamilus inflatus*)
E	Kidneyshell, triangular (*Ptychobranchus greeni*)
E	Lampmussel, Alabama Entire Range; Except where listed as Experimental Populations (*Lampsilis*

virescens)

XN Lampmussel, Alabama AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Lampsilis virescens*)

E Lilliput, pale (pearlymussel) (*Toxolasma cylindrellus*)

E Lioplax, cylindrical (snail) (*Lioplax cyclostomaformis*)

XN Mapleleaf, winged (mussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Quadrula fragosa*)

T Moccasinshell, Alabama (*Medionidus acutissimus*)

E Monkeyface, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Quadrula intermedia*)

XN Monkeyface, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Quadrula intermedia*)

E Mouse, Alabama beach (*Peromyscus polionotus ammobates*)

E Mouse, Perdido Key beach (*Peromyscus polionotus trissyllepsis*)

T Mucket, orangenacre (*Lampsilis perovalis*)

E Mucket, pink (pearlymussel) (*Lampsilis abrupta*)

E Mussel, oyster Entire Range; Except where listed as Experimental Populations (*Epioblasma capsaeformis*)

XN Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma capsaeformis*)

XN Pearlymussel, birdwing AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Conradilla caelata*)

E Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)

XN Pearlymussel, cracking AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Hemistena lata*)

XN Pearlymussel, dromedary AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Dromus dromas*)

E Pebblesnail, flat (*Lepyrium showalteri*)

E Pigtoe, dark (*Pleurobema furvum*)

E Pigtoe, finerayed Entire Range; Except where listed as Experimental Populations (*Fusconaia cuneolus*)

XN Pigtoe, finerayed AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Fusconaia cuneolus*)

E Pigtoe, flat (*Pleurobema marshalli*)

E Pigtoe, heavy (*Pleurobema taitianum*)

E Pigtoe, rough (*Pleurobema plenum*)

E Pigtoe, shiny Entire Range; Except where listed as Experimental Populations (*Fusconaia cor*)

XN Pigtoe, shiny AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Fusconaia cor*)

E Pigtoe, southern (*Pleurobema georgianum*)

E Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)

T Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)

T Pocketbook, finelined (*Lampsilis altilis*)

E Pocketbook, shinyrayed (*Lampsilis subangulata*)

E Ring pink (mussel) (*Obovaria retusa*)

E Riversnail, Anthony's Entire Range; Except where listed as Experimental Populations (*Athearnia anthonyi*)

XN Riversnail, Anthony's AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Athearnia anthonyi*)

T Rocksnail, painted (*Leptoxis taeniata*)

E Rocksnail, plicate (*Leptoxis plicata*)

T Rocksnail, round (*Leptoxis ampla*)

T Salamander, Red Hills (*Phaeognathus hubrichti*)

T Sculpin, pygmy (*Cottus paulus (=pygmaeus)*)

T Sea turtle, green (except where endangered) (*Chelonia mydas*)
E Sea turtle, hawksbill (*Eretmochelys imbricata*)
E Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E Sea turtle, leatherback (*Dermochelys coriacea*)
T Sea turtle, loggerhead (*Caretta caretta*)
T Shiner, blue (*Cyprinella caerulea*)
E Shiner, Cahaba (*Notropis cahabae*)
E Shiner, palezone (*Notropis albizonatus*)
E Shrimp, Alabama cave (*Palaemonias alabamae*)
T Slabshell, Chipola (*Elliptio chipolaensis*)
E Snail, armored (*Pyrgulopsis (=Marstonia) pachyta*)
E Snail, tulotoma (*Tulotoma magnifica*)
T Snake, eastern indigo (*Drymarchon corais couperi*)
E Stirrupshell (*Quadrula stapes*)
E Stork, wood (AL, FL, GA, SC) (*Mycteria americana*)
E Sturgeon, Alabama (*Scaphirhynchus suttkusi*)
T Sturgeon, gulf (*Acipenser oxyrinchus desotoi*)
T Tortoise, gopher (W of Mobile/Tombigbee Rs.) (*Gopherus polyphemus*)
E Turtle, Alabama red-belly (*Pseudemys alabamensis*)
T Turtle, flattened musk (species range clarified) (*Sternotherus depressus*)
E Wartyback, white (pearlymussel) (*Plethobasus cicatricosus*)
E Whale, finback (*Balaenoptera physalus*)
E Whale, humpback (*Megaptera novaeangliae*)
E Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 18
Status Listing
T Amphianthus, little (*Amphianthus pusillus*)
T Potato-bean, Price's (*Apios priceana*)
T Fern, American hart's-tongue (*Asplenium scolopendrium var. americanum*)
E Leather flower, Morefield's (*Clematis morefieldii*)
E Leather flower, Alabama (*Clematis socialis*)
E Prairie-clover, leafy (*Dalea foliosa*)
T Sunflower, Eggert's (*Helianthus eggertii*)
T Bladderpod, lyrate (*Lesquerella lyrata*)
T Button, Mohr's Barbara (*Marshallia mohrii*)
E Harperella (*Ptilimnium nodosum*)
T Water-plantain, Kral's (*Sagittaria secundifolia*)
E Pitcher-plant, green (*Sarracenia oreophila*)
E Pitcher-plant, Alabama canebrake (*Sarracenia rubra alabamensis*)
E Chaffseed, American (*Schwalbea americana*)
E Pinkroot, gentian (*Spigelia gentianoides*)
T Fern, Alabama streak-sorus (*Thelypteris pilosa var. alabamensis*)
E Trillium, relict (*Trillium reliquum*)
E Grass, Tennessee yellow-eyed (*Xyris tennesseensis*)

APPENDIX C

SPECIES THAT ARE STATE LISTED AS PROTECTED IN THE STATE OF ALABAMA

Nongame Species Protected by Alabama Regulations [No State Threatened or Endangered status; certain "nongame" species given special protection against "take"; "take" not specifically defined.]

(a) FISHES

Common Name	Scientific Name
Alabama Cavefish	Speoplatyrhinus poulsoni
Southern Cavefish	Typhlichthys subterraneusls
Spotfin Chub	Cyprinella monacha
Boulder Darter	Etheostoma wapiti
Coldwater Darter	Etheostoma ditrema
Crystal Darter	Crystallaria asprella
Goldline Darter	Percina aurolineata
Holiday Darter	Etheostoma brevirostrum
Lollipop Darter	Etheostoma neopterum
Rush Darter	Etheostoma phytophilum
Slackwater Darter	Etheostoma boschungi
Snail Darter	Percina tanasi
Tuscumbia Darter	Etheostoma tuscumbia
Vermilion Darter	Etheostoma chermocki
Watercress Darter	Etheostoma nuchale
Frecklebelly Madtom	Noturus munitus
Pygmy Sculpin	Cottus paulus
Alabama Shad	Alosa alabamae
Blue Shiner	Cyprinella caerulea
Cahaba Shiner	Notropis cahabae
Palezone Shiner	Notropis albizonatus
Spring Pygmy Sunfish	Elassoma alabamae
AL Shovelnose Sturgeon	Scaphirvnchus suttkusi
Gulf Sturgeon	Acipenser oxyrhynchus desotoi

(b) AMPHIBIANS

Common Name	Scientific Name
Dusky Gopher Frog	Rana capito sevosa
Eastern Hellbender	Cryptobranchus alleganiensis alleganiensis
Flatwoods Salamander	Ambystoma cingulatum
Green Salamander	Aneides aeneus
Red Hills Salamander	Phaeognathus hubrichti
Seal Salamander	Desmognathus monticola(of Coastal Plain origin)
Tennessee Cave Salamander	Gyrinophilus palleucus
Pine Barrens Treefrog	Hyla andersonii

(c) REPTILES

Common Name	Scientific Name
Eastern Coachwhip	Masticophis flagellum flagellum
Black-knobbed Sawback	Graptemys nigrinoda
Black Pine Snake	Pituophis melanoleucus lodingi
Eastern Indigo Snake	Drymarchon corais couperi
Florida Pine Snake	Pituophis melanoleucus mugitus
Gulf Salt Marsh Snake	Nerodia fasciata clarkii
Southern Hognose Snake	Heterodon simus
MS Diamondback Terrapin	Malaclemys terrapin pileata
Gopher Tortoise	Gopherus polyphemus

Alabama Map Turtle	Graptemys pulchra
Alabama Red-bellied Turtle	Pseudemys alabamensis
Alligator Snapping Turtle	Macroclemys temminckii
Barbour's Map Turtle	Graptemys barbouri
Escambia Bay Map Turtle	Graptemys ernsti

(d) BIRDS

Common Name	Scientific Name
MS Sandhill Crane	Grus canadensis pulla
Common Ground Dove	Columbina passerina
Bald Eagle	Haliaeetus leucocephalus
Golden Eagle	Aguila chrysaetos
Reddish Egret	Egretta rufescens
Peregrine Falcon	Falco peregrinus
Cooper's Hawk	Accipiter cooperi
Merlin	Falco columbarius
Osprey	Pandion haliaetus
American Oystercatcher	Haematopus palliatus
American White Pelican	Pelecanus erthrorhynchos
Piping Plover	Charadrius melodus
Snowy Plover	Charadrius alexandrinus
Wilson's Plover	Charadrius wilsonia
Wood Stork	Mycteria americana
Gull-billed Tern	Sterna nilotica
Bachman's Warbler	Vermivora bachmani
Red-cockaded Woodpecker	Picoides borealis
Bewick's Wren	Thryomanes bewickii

(e) MAMMALS

Common Name	Scientific Name
Gray Myotis Bat	Myotis grisescens
Indiana Bat	Myotis sodalis
Rafinesque's Big-eared Bat	Corynorhinus rafinesquii
Southeastern Bat	Myotis austroriparius
Southeastern Pocket Gopher	Geomys pinetis
Alabama Beach Mouse	Peromyscus polionotus ammobates
Meadow Jumping Mouse	Zapus hudsonius
Perdido Key Beach Mouse	Peromyscus polionotus trissylepsis
Long-tailed Weasel	Mustela frenata

APPENDIX D

IDENTIFIED PUBLIC AND PRIVATE ACCESS DOUBLE-CRESTED CORMORANT WINTER ROOSTS LOCATED IN THE STATE OF ALABAMA

IDENTIFIED PUBLIC AND PRIVATE ACCESS DOUBLE-CRESTED CORMORANT WINTER ROOSTS LOCATED IN THE STATE OF ALABAMA

PUBLIC

Big German (Hale County, AL)
Bridge Roost (Wilcox County, AL)
Conner's Isle (Marshall County, AL)
Cook Creek (Dallas County, AL)
Cypress Slough (Greene County, AL)
D-14 (Corps of Engineers) (Greene County, AL)
Dead Lake (ALGFD) (Greene County, AL)
Demopolis Dam (Sumter County, AL)
Eufaula, Lake (Barbour County, AL)
Hurricane Island (Wilcox County, AL)
Limestone Creek (Hale County, AL)
Lubbub Creek (Pickens County, AL)
Martin Slough (Hale County, AL)
Miller's Ferry (Wilcox County, AL)
North Sauty (Jackson County, AL)
Pickensville (Pickens County, AL)
Pine Barren Creek (Wilcox County, AL)
River Roost (Wilcox County, AL)
Roseberry Creek Towers (Jackson County, AL)
Siebold Towers (Marshall County, AL)
South Sauty (Jackson County, AL)
Swilley's Bend (Sumter County, AL)
Vienna (Pickens County, AL)
Webb's Bend (Marengo County, AL)
Wilke's Creek (Greene County, AL)
Weiss Lake (Cherokee County, AL)

PRIVATE

Cypress Pond (Tuscaloosa County, AL)
Double Creek (Marengo County, AL)
Glass Lake (Perry County, AL)
Grinnel Pond (Tuscaloosa County, AL)
Keaton Lake (Tuscaloosa County, AL)
Oak Chia (Sumter County, AL)
Prattville (Autauga County, AL)
Stella's Pond (Hale County, AL)
Store's Lake (Hale County, AL)
Taylor Lake (Sumter County, AL)